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VOLUME THIRTY-SIX • NUMBER 10

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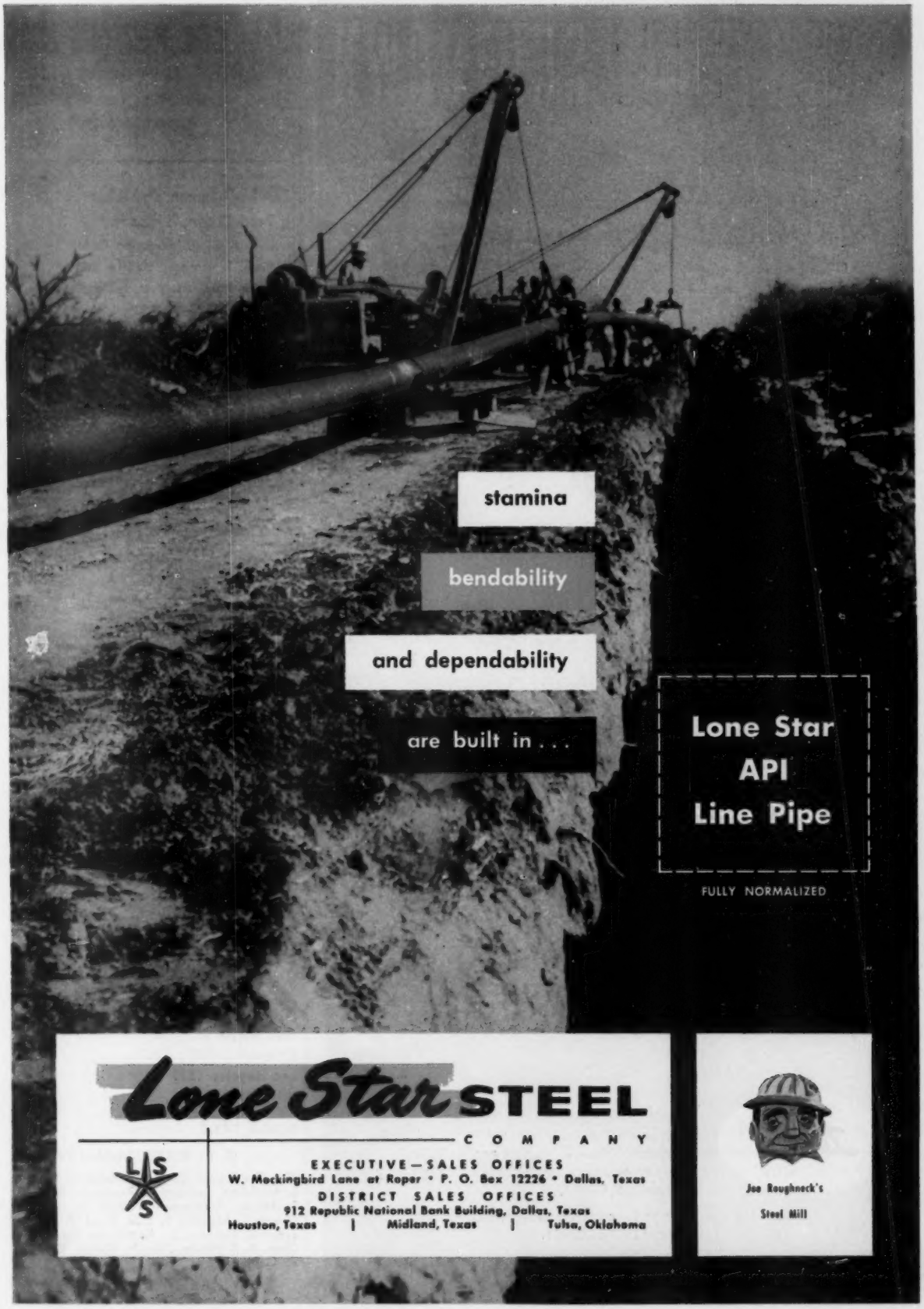
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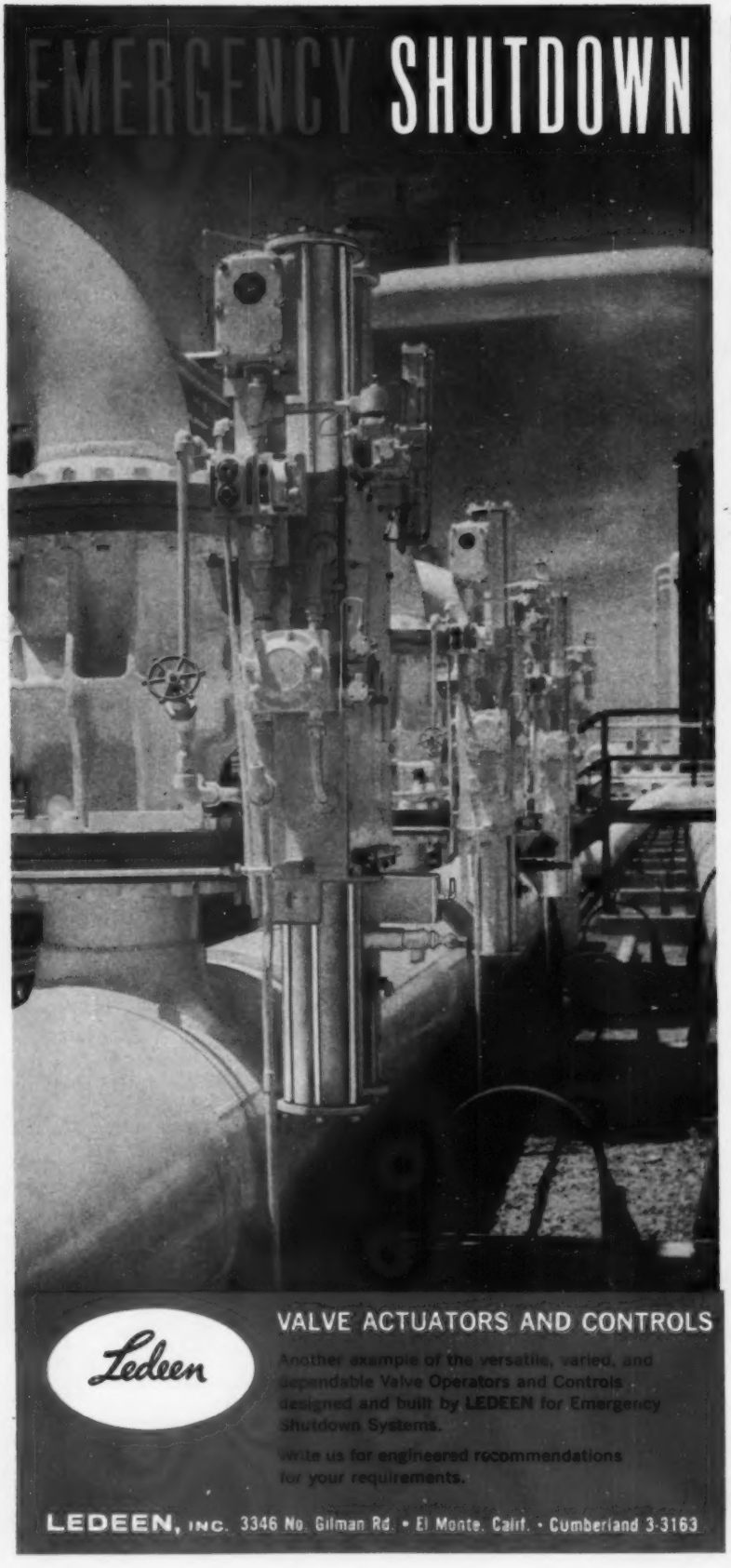
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CALENDAR

October

4-5..Gas Measurement Institute — National Guard Armory, Liberal, Kan.

5-7..Wisconsin Utilities Association Gas, Electric, Sales & Engineering Convention—Schroeder Hotel, Milwaukee.

9-12..AGA Annual Convention—Atlantic City, N. J.

17-21..National Safety Council Annual Meeting—Chicago.

24-25..Independent Petroleum Association of America Annual Meeting —Statler Hilton, Dallas.

25-26..AGA-NEGA Safety Course — Parker House, Boston.

November

1..NEGA Operating Division—Statler Hilton, Hartford, Conn.

14-16..American Petroleum Institute Annual Meeting—Chicago.

15-16..Natural Gas Pipeline Institute—Court Room, Court House, Liberal, Kan.

December

5-9..AGA Gas Air Conditioning Sales School—Nationwide Inn, Columbus, Ohio.

1961

March

13-17..National Association of Corrosion Engineers Annual Meeting Hotel Statler, Buffalo.

15-17..New England Gas Association Annual Meeting — Statler-Hilton Hotel, Boston.

20-22..AGA General Management Section Conference—Frances-Marion Hotel, Charleston, S. C.

27-29..Mid-West Gas Association Annual Meeting — Sheraton-Fontenelle Hotel, Omaha.

April

13-15..GAMA Annual Meeting—Boca Raton, Fla.

24-26..Southern Gas Association Annual Meeting—New Orleans.

May

8-12..AGA Operating Section, Distribution & Production Conference —Sheraton Hotel, Philadelphia.

25-26..AGA Operating Section, Transmission Conference—Brown Palace and Cosmopolitan Hotel, Denver.

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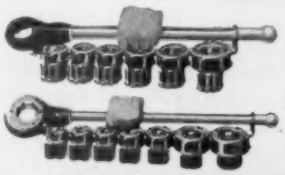

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OCTOBER 1960

Thermally Thinking

On the road

WITH mental stimulation somewhat reduced and physical activity definitely reined in due to an awfully hot summer, perhaps it is a good time to tell you what a few of our people are doing.

GAS' Eastern Editor, Bill Harper, led a reasonably active life during August and September. In the midst of trying to get settled in a new home, along with wife and six (or is it seven, now?) children, ye editor dispatched him to the wilds of West Virginia to look into the Terra Alta underground storage project.

While Bill was doing that, I was doing something. Exactly what escapes me for the moment.

Friend Harper returned to Philadelphia just in time to hop up to New York on a Saturday to visit with Mr. and Mrs. L. T. Potter. His quest was to find out what sort of chap AGA's new president is. His literature on Lone Star's, and now AGA's, prexy is in this issue.

I think I played golf that Saturday. If not, then I went swimming.

To shake our boy out of his lethargy, I asked Mr. Harper to jaunt down to Nashville, Tenn., the next weekend to see a new compressor installation on the Columbia Gulf pipeline system. He went a little early and spent a Sunday (Aug. 21) with Mr. and Mrs. Wister Ligon on their houseboat at a nearby lake.

I think I was forced to ease up and rest over Sunday. No, on second thought, I flew to Washington, D. C. (only 4.5 hours by jet from L.A.) on that date. Thus, Bill was taking a good look at Columbia Gulf's system while I was watching the pedestrian path of this fine old Republic being hewn.

My Washington activities included a visit and lunch with AGA's astute statesman, Curtis Morris; several ex parte conversations with various gas companies' Washington representatives; many hours in the Press Galleries of both the House and Senate; and attending the President's press conference for the week.

Actually, I was invited by Mr. Eisenhower to sit in on the press session. But, less I suffer a loss of modesty, I must explain that Neil Regeimbal of GAS' Washington Bureau arranged this. Frankly, our President neither knew nor, I suspect, cared that this humble one was puttering about the Potomac.

Hurry-up Harper returned to Philadelphia, then picked me up in the Capitol and drove me to Morgantown, W. Va., in time for me to address the general assembly of the Appalachian Gas Measurement Short Course on Monday, Aug. 29. As "The Last of the Red Hot Monotones," I was glad when that one was over. However, people there were most kind.

Bill Harper returned to Philadelphia and I went to New York.

The purpose for the New York leg is unique, if not interesting. As I hope you know, GAS Magazine publishes a daily newspaper at AGA annual conventions. Putting an AGA "Convention Daily" under the hotel-room doors of every delegate at 5 a.m. on each of the three days of these meetings is quite a task. It takes about six of GAS' staff, quite a bit of cash, and staying "awake" about 20 hours per day to get the job done.

Our Publisher, Frank Chapman, diabolically insists this is a lot of fun. It does keep us out of trouble, relatively speaking.

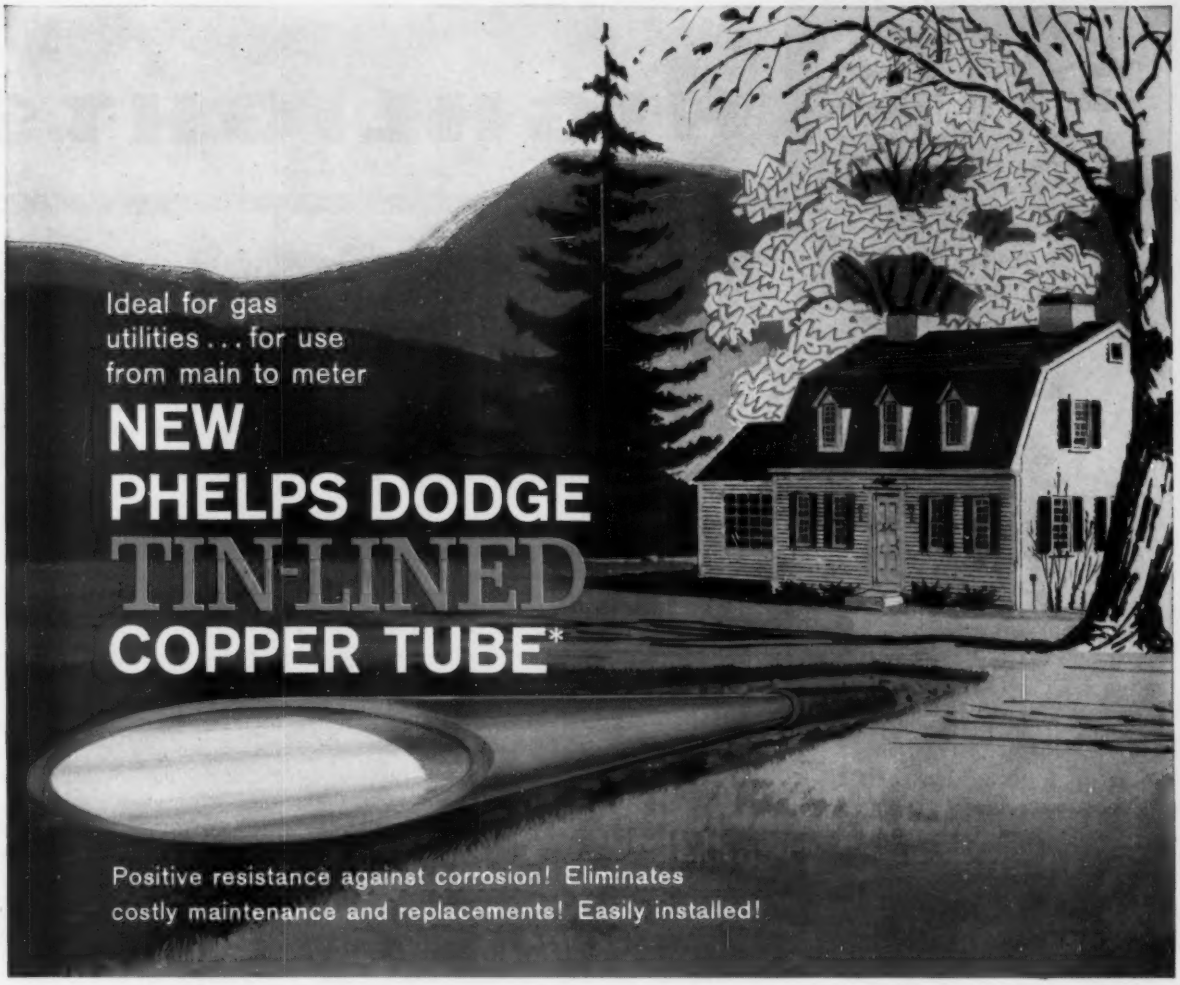
This year, however, something new has been added. In addition to newspapering, we are also going on TV. AGA is rigging up a closed-circuit network between Convention Hall and most of the boardwalk hotels in Atlantic City. Delegates can flip their room TV units to Channel 2 (I think it is) and view the AGA Network. GAS Magazine has been asked to do the news telecasting. As usual, we will have a United Press International teletype machine (24-hour wire) in our City Room for the newspaper effort, so we will be able to put national and international news on the AGA TV Network as fast, or probably faster, than commercial radio or TV stations. And there goes our four hours of sleep.

So, here we are in Los Angeles in mid-September. Harper is up in Canada this morning and I am trying to figure out how to make a C or C lunch for Transwestern Pipeline Co. in L. A. on Sept. 19; attend the PCGA meeting in Phoenix, Sept. 21-23; get over to El Paso where a story awaits; then up to Big Piney, Wyo., where another story calls; and then fly with Asst. Editor Barbara Hall to Atlantic City by Oct. 4.

In any case, we have made it before and we'll make it again. Perhaps I'll even find time to shake hands with my wife and pat my son on the head before I go East again.

J. Fred Ebstan

EDITOR



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GAS HIGHLIGHTS

Phillips decision may produce prime blueprint

The coming decision by FPC in the matter of the original Phillips case —which should be out by the time you read this—will probably be the most important move made by the commission in recent years. After wrangling with this one for more than a decade, the final wrap-up was due in September. It is hoped in the gas industry that a clear-cut, fog-cutting portrait of FPC's basic regulatory philosophy and technique will emerge to erase some 10 years of conflicting court decisions that have resulted in relative chaos among natural gas producers and other segments of the industry.

Plastics pipe goes into OFG system

Extension of natural gas service to North Robinson, Ohio, marked the first use of plastics pipe on a community-wide scale by Ohio Fuel Gas Co., Columbus. The entire distribution system, except for medium-pressure supply line, was constructed of plastics pipe in 2-, 3-, and 4-in. diameters. OFG has tested sections of plastics pipe in the past in a number of different locations. Experience indicates the material to be "completely satisfactory in all respects."

Cal PUC recognizes gas co. advertising & promotion costs

California's commission approved rate increases in late August for SoCal and SoCounties Gas companies. In doing so, an important question was settled. At sharp controversy during the long hearings was the concept of expenditures for advertising and sales promotion.

While the commission did cut such amounts sought as chargeable expenses by the companies, it did not limit the amounts either may spend for these purposes. And it recognized the value of such activities by utilities.

During the hearings, the staff attorney's brief verbally spanked the companies for expenditures they have made for advertising and sales promotion. However, Commissioner C. Lyn Fox in a concurring opinion, in which he was joined by Commissioner Matthew J. Dooley, had this to say about the staff attorney's brief: (It was) "Extremely intemperate and improper" in discussing sales promotion expenses. He said the brief "attempted by innuendo to besmirch applicant, accused hundreds of newspapers in the state of attempting to coerce the commission and intimated that newspaper opposition to the staff's recommendations was for pecuniary reasons rather than because of honest disapproval of the invasion by staff engineers of fields beyond the legitimate sphere of engineers." (For more details, see Distribution News.)

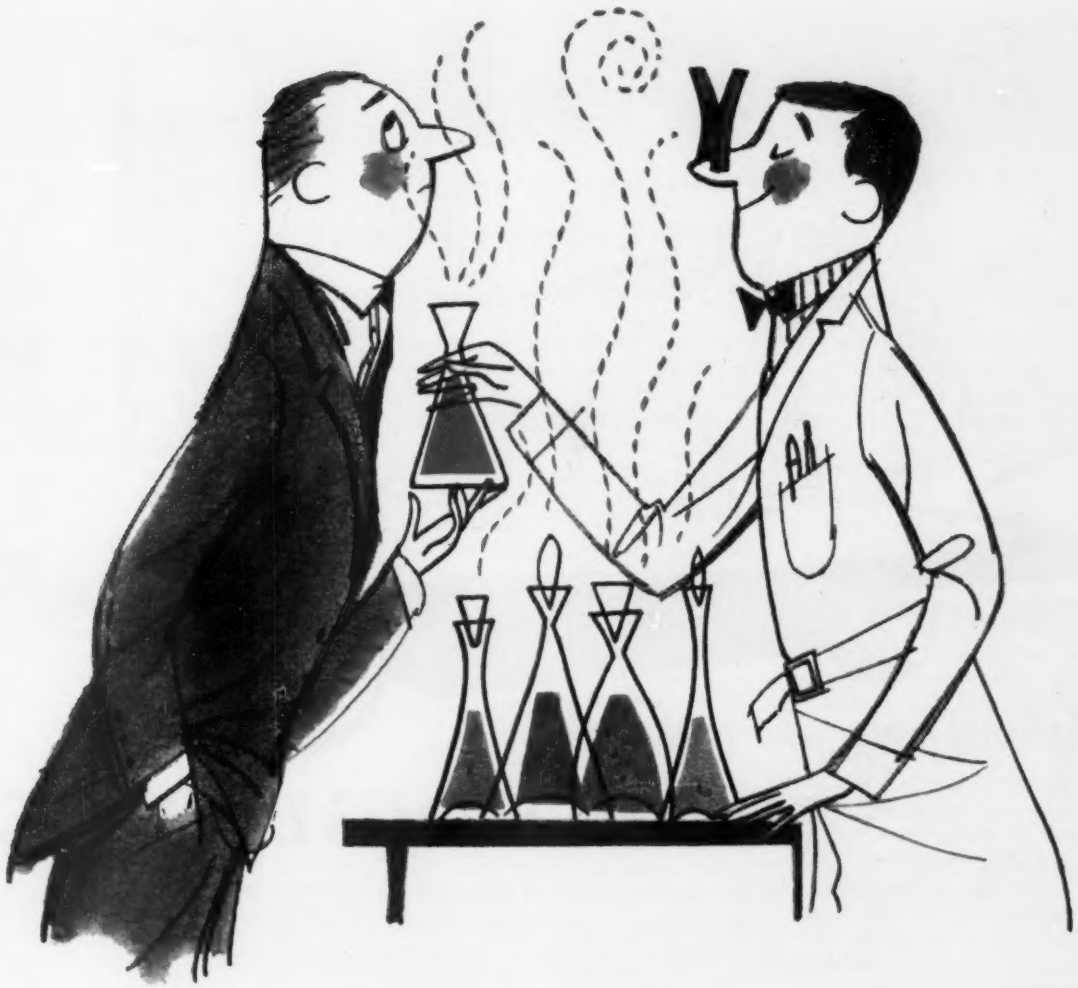
FPC sliced Midwestern's return

Midwestern Gas Transmission got a 6.5 per cent rate of return from FPC instead of the asked-for 7 per cent. The most recent development applies to the northern portion of Midwestern's system. For the southern segment, now in operation, a 6.25 per cent return was previously set. Combined, the company gets an average 6.38 per cent return for the entire system. (See Pipeline News.)

The action means Midwestern has to file new rates prior to starting deliveries through the northern section. Construction is winding up rapidly on the projects and deliveries will start this fall—so it is expected that the new schedule of tariffs will be filed very quickly. An alternative would be to challenge FPC on the return set.

TGT and So-Cal Edison ink contract

The second important forward step in the $225-million pipeline project involving Petroleos Mexicanos and a route through old Mexico, from Texas to California, was taken when Tennessee Gas Transmission and Southern California Edison Co. of Los Angeles signed a gas-purchase delivery contract. The pact called for up to 455 MMcfd for a 20-year period beginning in 1962.



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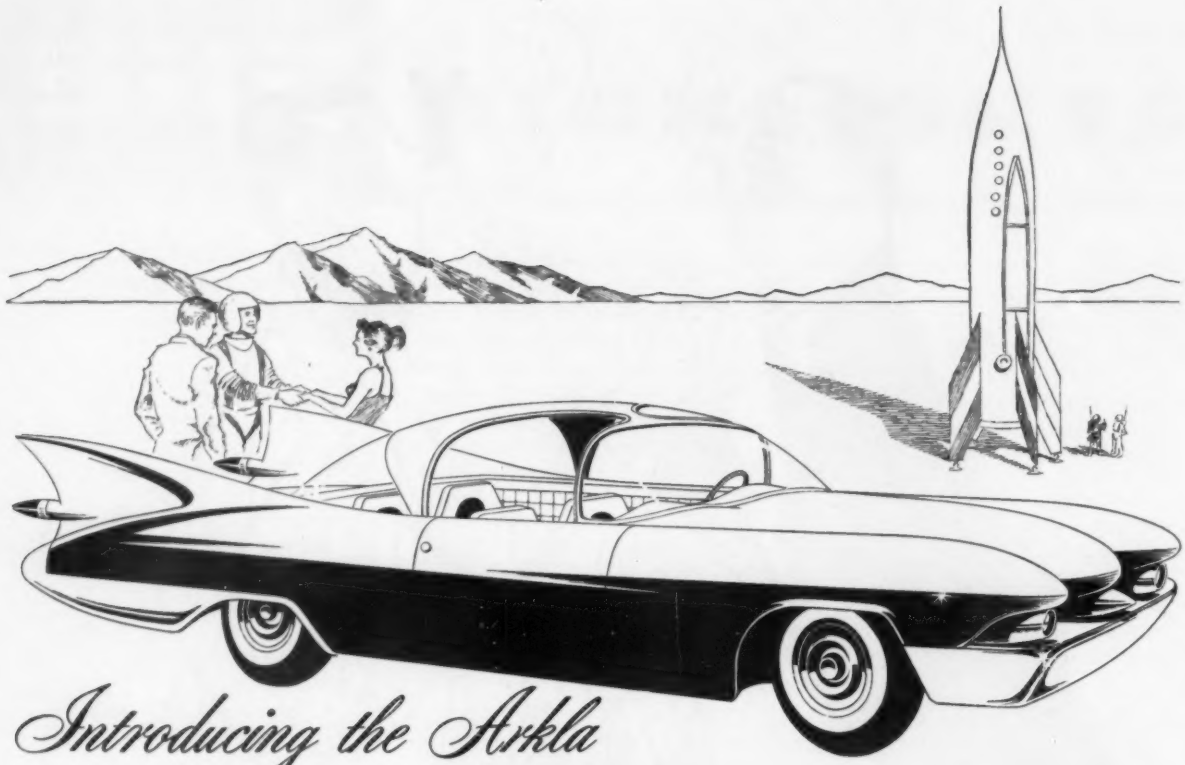

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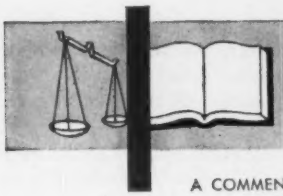


Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

Rolled-in rates are valid

MR. JUSTICE REED, retired from the Supreme Court, but participating in the United States Court of Appeals for the District of Columbia, concluded that FPC rolled-in rates are valid.

An appeal had been taken by a battling indirect customer of Trunkline Gas Co. — the Battle Creek Gas Co.—from an FPC order granting a certificate of public convenience and necessity to enlarge Trunkline's pipeline capacity. The cost of expansion was allocated to all system customers, except that the exclusive use facilities were assessed against the single connected customer.

Trunkline operates an interstate pipeline bringing natural gas from the Texas-Gulf of Mexico production areas north to Tuscola, Ill., where it joins the Panhandle Eastern Pipeline system. Trunkline is wholly owned by Panhandle. All but a small quantity of its gas is sold to Panhandle at Tuscola to be resold to consumers through the Panhandle pipeline system.

FPC authorized Trunkline to increase its gas purchases in the Gulf of Mexico, to expand its pipeline capacity by increased pumping and looping of the pipeline, and to construct new lines from Tuscola to the Michigan-Indiana border where 135 MMcfd of the increased gas supply will be sold to one customer, Consumers Power Co. and its affiliate, Michigan Gas Storage Co. Up to this time Consumers had purchased all its gas from the Panhandle system through Michigan Gas Storage Co.

Battle Creek Gas Co. is a local gas distribution company which has purchased its gas from Panhandle. Battle Creek intervened in the certificate proceedings before the commission to request an allocation of 4 MMcfd of gas during the five winter months of each heating season. Battle Creek's application contemplated that this gas would be delivered to it through Panhandle's facilities by use of Michigan Storage's facilities and storage fields.

Intervenor Illinois Power Co. also purchases its natural gas supply from Panhandle. Illinois Power's interest is limited to the method by which the cost of the expansion will be allocated to Trunkline's customers, particularly Panhandle.

• FPC findings

The accounting method to be used in reflecting the cost of the new facilities in the rates of the customers was the main issue. Trunkline's application contemplated a price for the new gas to be sold to Consumers adequate to cover on an incremental basis the entire cost of the expansion project, including the new gas supplied, the new gathering lines, the partial looping of Trunkline's main transmission line, an additional compressor at Tuscola, and the additional pipeline up to the Michigan-Indiana border. By this method, Consumers' customers would bear the entire cost of this expansion program. FPC adopted its staff's recommendation that opposed this incremental cost method. FPC chose the staff's method No. 1, providing that all the costs of the expansion program up to Tuscola be "rolled-in" with the other system-wide costs of Trunkline, and be considered in fixing the rates of all of Trunkline's customers. Under this method the costs of the pipeline from Tuscola to the Michigan-Indiana border would be charged directly to Consumers.

Mr. Justice Reed, as spokesman for the court, had many reasons for validating rolled-in rates.

The role of reviewing courts in passing on the rate-making methods used by administrative agencies is necessarily narrow. These matters are properly for the commission.

There are two basic methods of allocating new asset costs to be reflected in a utility's rate structure. The first recognizes that a gas pipeline of this kind is not just a collection of pieces, but an integrated system serving all of its customers. Applying this approach the cost of the various assets of the system are collected or "rolled-in" to arrive at cost of the entire system which is then pro-rated among all of the customers by one of several rate-making mechanisms.

This method has many advantages and the commission has repeatedly stated a general preference for it wherever it is equitable. It avoids the administrative burden of having to assign a different portion of the cost to each of a large number of customers. It results, if all other factors be equal, in all customers paying the same price for gas taken from the pipeline at the same point, and recognizes that all customers enjoy the benefits of having the whole gas pipeline system.

The rolled-in rate method is generally disadvantageous, however, to old customers of an expanding pipeline. The cost of new facilities and natural gas has risen steadily, and a rolled-in rate requires old customers to pay a higher price and bear part of the cost of an expansion from which they receive little visible increase in service. Use of the rolled-in approach ensures that two similar customers will not pay radically different prices for commingled gas coming from the same pipe, merely because

one happens to have been receiving the service longer than the other. Use of the rolled-in method thus serves the interest of equal treatment for customers receiving equal service.

Use of a rolled-in approach is not adequate in all situations, particularly where some assets are used by the utility solely for the benefit of one customer. At some point in every interstate gas pipeline the general system ends and connective links to the local distributors' own equipment begins. At this point the facility becomes so identified with its function as a part of the local distributor's gas plant that it may be unfair to charge its costs to all of the customers of the utility. In such a situation the cost of these facilities is commonly charged as an "incremental" cost to the particular customer.

The expanded facilities will form part of an integrated Trunkline system and the greater capacity will benefit the entire system. The new gas is to be commingled with the old gas, and then distributed to all customers. For the first two years after the expansion, before Consumer's will be able to utilize the entire new capacity, some gas would be available to other customers from the new fields. Most importantly, said Justice Reed, "the conclusion that these facilities will be integrated with the Trunkline system is supported by the character of the expansion as the first step in an overall expansion program, eventually designed to meet all of the requirements of all of Trunkline's customers." The facilities involved in these applications will provide "cheap expansibility" to Trunkline, permitting future expansions to be made by relatively inexpensive increases in pumping facilities and partial looping at a fraction of what the further expanded capacity would otherwise cost. This partial expansion also opens up new gas reserves and new producing areas to meet the needs of Trunkline's customers.

The court found the commission's basic conclusion that this expansion would be part of the integrated gas system to be proper, and therefore affirmed the rolled-in allocation method. This conclusion is confirmed by the later FPC applications of Trunkline, showing an intent to utilize the "cheap expansibility" and new reserves for the benefit of all customers made available through the facilities involved in this case.

In addition, the Court affirmed the commission's decision to roll-in the cost of new facilities and gas supplies immediately rather than when the full expansion program is completed.

The commission has many times treated the problem of incremental as against rolled-in rates and has in the vast majority of the instances provided for rolled-in rates. In this connection there are a large number of cases dealing with incremental gas supplies wherein the problem is not even discussed since it is understood that the incremental supply of gas will be sold under the pipeline's existing rate schedules and, hence, the issue does not arise.

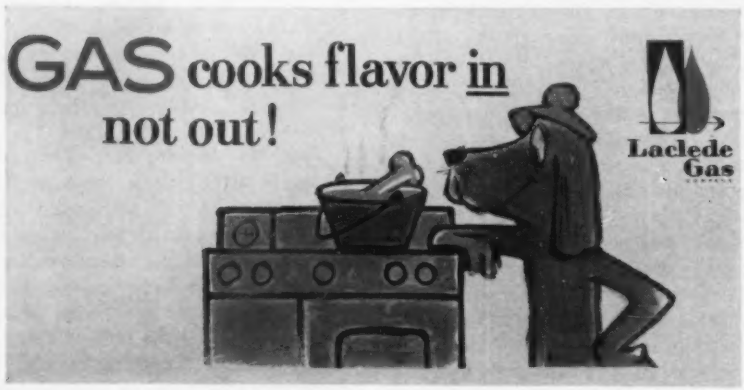
Proceedings where the conflict between incremental and rolled-in rates was in issue, and the commission adopted a rolled-in approach after discussing the problem are *El Paso Natural Gas Company*, 7 FPC 908, 910 (1948); *Atlantic Seaboard Corporation*, 11 FPC 43, 58 (1952) affirming the extended discussion of the Presiding Examiner, 11 FPC 486, 528-35, and *Texas Gas Transmission Company*, 11 FPC 227, 261 (1952).

FPC has departed from its rolled-in rate practice in a Natural Gas Pipeline case. The commission distinguished that case, because the incremental gas supply from Natural's interstate pipeline supplier was not commingled with Natural's gas but was served by displacement.

In this present Trunkline case, Battle Creek contended that the commission's order permitting the expansion of facilities to serve only one customer was a discriminatory allocation of the increased capacity. As a corollary to this contention, Battle Creek argued that the commission failed to exercise its statutory responsibility to allocate the expanded capacity among the customers of the Panhandle-Trunkline system.

During the pendency of this case several applications for further expansion of the Trunkline and Panhandle facilities have been filed with the commission. The parties agree that these expanded facilities, if authorized by the commission, will provide enough gas to meet all present requirements of the customers including Battle Creek. It is satisfied that the new applications eventually will be granted in some form, so Battle Creek declined to press this aspect of the case on oral argument to the Court.

Rolled-in rates will continue to be preferred by FPC, especially now that an appelate court has affirmed the commission's rationale. ■



Laclede Gas Co. is creating a casual friendly image of itself and selling gas at the same time with a new outdoor poster campaign. The poster series employs a comical, cartoon-style dog placed in home-style situations. His whimsical outlook sharply focuses consumer attention on straight, hard-sell copy theme. The high-impact poster campaign was developed by the D'Arcy Advertising Co. for Laclede. It delivers its message to more than 1.4 million people.

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You owe it to yourself to take advantage of the many cost saving factors Grabler pipe fittings offer. Grabler fittings come to you in easy to handle cartons plainly marked. They are easier to stock and use. Packaging keeps them clean and instantly useable. Start saving money by standardizing with Grabler package protected pipe fittings.

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Acme-Newport Steel COMPANY

NEWPORT, KENTUCKY

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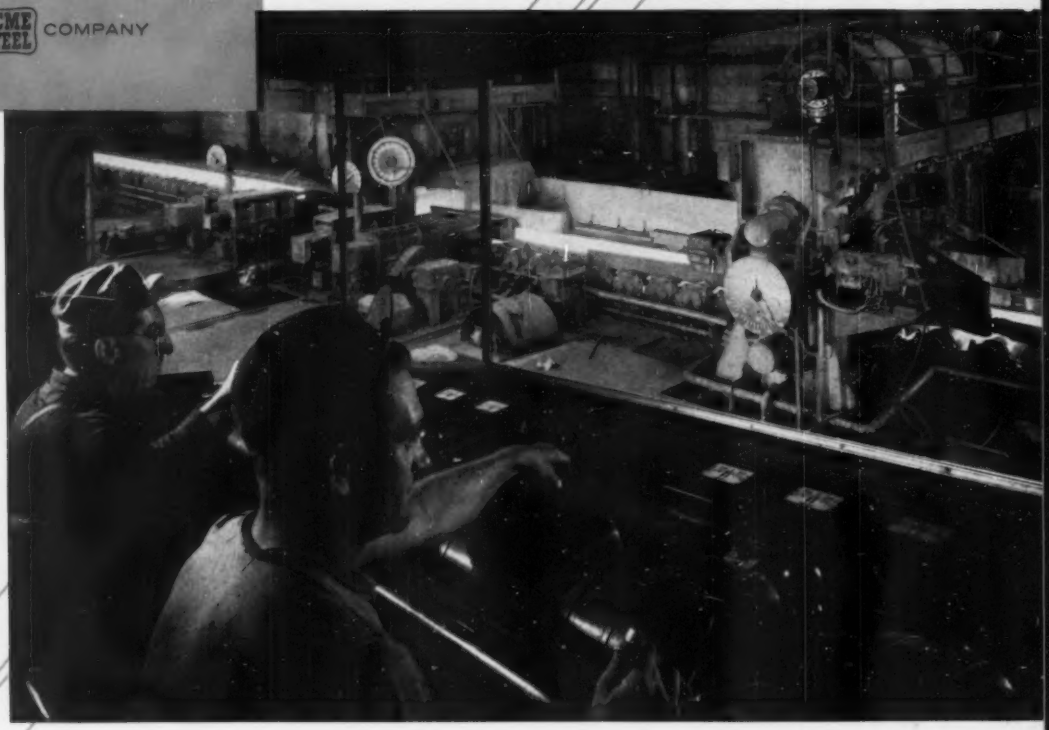

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Experience, Youth, Modern Facilities

At Acme-Newport you have a time-tested formula for unexcelled quality in electric weld line pipe . . . a combination of 75 years' steelmaking background, efficient new facilities, men with long experience and with youthful drive. Over 25% of the personnel have served 25 years or more, while young men continually are being well trained to maintain the quality traditions of this basic steel producer.

The result is consistent pipe performance on which you always can depend. Every length is true round and uniform in wall thickness. It bends readily, welds easily, installs and functions trouble-free. Available in 4" and 6" sizes, standard or thin wall. Ask for complete information.

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Steel

***SIZES AND WEIGHTS AVAILABLE**

O.D.	Wall	Wt. Per Ft.
4½	.125"	5.84
	.142"	6.61
	.156"	7.25
	.188"	8.64
	.219"	10.00
	.237"	10.79
6⅝	.156"	10.78
	.188"	12.89
	.219"	14.97
	.250"	17.02
	.280"	18.97

TECHNICAL TRENDS

By GUY CORFIELD
Professional Engineer,
Los Angeles

Magnetohydrodynamics

This formidable word has been devised to identify and to some extent describe one of the newest ways that is being explored for the direct conversion of heat to electricity. The principle is this: if a high temperature ionized gas (that could be natural gas combustion products) is passed through a channel across which a magnetic field is imposed, electrodes on either side of the channel will develop a difference in potential and electrical energy can be withdrawn from them.

This system is somewhat analogous to the rotating electric direct current generator. The ionized combustion products correspond to the armature, the magnetic field to the field coils, and the electrodes to the brushes. The high temperature involved, requiring materials to resist it, is one of the principal problems.

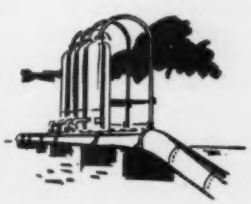
Several big names in U. S. research are reported to be actively exploring this system. Practical applications, at least for special purpose uses, may soon be developed. As an indication of the progress, Westinghouse has recently announced a unit which burns furnace oil and oxygen. Potassium soap is added to the oil. High temperature combustion products are produced in which the potassium soap ionizes to provide free electrons. The products pass through a water-cooled refractory-lined tube under the magnetic field influence, and electric current is taken off from graphite electrodes. Runs of several minutes duration have been made at outputs as high as 5 kw.

Traces

A compact and completely enclosed unit has been developed which, *flanged and bolted into a gas line, develops electricity for local use.* It consists essentially of a turbine wheel which is rotated by the gas flow and drives a permanent magnet electric generator. It generates from 500 to 1500 watts at 110 v at 20 psig gas pressure across it, over a wide range of gas flow rates and pressures. Repairs or replacements can be conveniently made through a removable head.

A flexible "rope" made up of hundreds of very fine glass threads, permits *viewing* around corners or in non-accessible spaces like *the interior of a pipe.* Each thread carries its own beam of light within itself regardless of how bent, to provide illumination, and transmits the light back again in proportion to the reflectivity of the object it "sees." Therefore, if the ends of the threads at each end of the rope or cord are arranged in exactly the same relative position, the bundle sends back to the eye the image of the object being viewed as a picture made up of hundreds of tiny dots. This technique can be extended to photography or even to closed circuit TV.

A *plastic lead* material, made up of 94 per cent lead powder and 6 per cent epoxy resin, has been developed by the Devcon Corp., Danvers, Mass. It comes in putty-like form to be mixed with a catalyst, and then can be applied to any surface or molded to any shape. It hardens in about 3 hours to a tough consistency with good adherence to any clean surface, and similar to lead metal in corrosion resistance in that it can be drilled, cut, shaped with a hammer. etc. The shrinkage in hardening is only 0.0005 in. per in. It will assertedly have application for plugging leaks in piping, building up castings, etc.; in general, for any purpose that lead metal would be used, with the added advantage of its bonding ability.



The new Eddystone station of Philadelphia Electric Co. is said to have the *world's highest pressure and temperature steam power plant.* The units have boilers based on the Swiss Sulzer once-through design. Unit 1 is now operating at 5000 psig and 1200 deg F. Unit 2 will operate at 3500 psig and 1060 deg F. In this super-critical pressure range, once-through design, feed water is converted into steam almost instantly without boiling, with a "residence time" of approximately 2 minutes, as compared to 6 or 7 minutes for a conventional drum-type boiler.

One possible answer to the constantly recurring problem of high temperature resistance is the development of *fiber-reinforced metal.* The addition of high-strength ceramic fibers enables metals and alloys to retain much of their strength at bare-melting point temperatures, while reducing their weight to a more favorable strength-to-weight ratio. The optimum types of fiber and fiber-top-metal proportions are still being developed. One good combination is said to be an alloy of 80 per cent nickel and 20 per cent chromium with fiber of aluminum oxide.

A new *semiconductor material,* for thermocouple cooling through the Peltier effect, is being developed under the name of Neelium. It is a combination of bismuth, tellurium, selenium and antimony. The first application will be as a Frigistor, incorporating 8 Neelium thermocouples for cooling solid state electronic devices such as transistors, diodes and rectifiers.

WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau
1093 National Press Bldg.
Washington 4, D. C.

Gun-shy FPC lacks original thinking

FEDERAL POWER COMMISSION is displaying an increasing fear of original thinking or conviction.

Obviously gun-shy from past criticism and investigations, the agency is falling into the same patterns of absurd actions in administering control over the multi-billion dollar natural gas industry as have the older agencies in regulating other industries. While still professing to abhor the degree of regulation imposed by courts, the FPC shows more and more signs of aping the pattern of federal regulatory agencies such as the Interstate Commerce Commission which has forced the nation's railroad industry almost to the brink of bankruptcy.

As yet, the commission still hasn't fallen into the pattern of defending all of its actions as the light from above. Occasionally, some members note a little sheepishly when the results of the regulatory process are particularly illogical that perhaps a decision isn't in the interest of the consumer or the industry.

But like any attacked group, they are tending to stick closer and closer together to ward off their antagonizers, with a resulting growing tendency to unanimous decisions and stout defenses of their actions.

In one recent case, when the commission trimmed back the price of seven Texas producers for sales to Peoples Gulf Coast Natural Gas Pipeline Co., Commissioner Arthur Kline noted that the 2-cent cut to 18 cents might kill the project because higher prices are being paid for gas in the same area for direct industrial sales.

The skittish, increasingly shy trend at the commission was clearly displayed as the members tried after more than a decade to put the finishing touches on the decision in the original Phillips case—first of all the producer controversies. Inclinations to break fresh ground, to seriously try to set a workable pattern of regulation, and to erase the chaos 10 years of conflicting court decisions have produced were for the most part stifled and replaced by efforts at conformity to the confusion of the past.

While it was the electric companies which took the blow in another case, the developing trend was again in evidence when the FPC cracked down on political advertising. Three years after 76 electric companies ran a series of advertisements dealing with the public-vs-private power fight, the FPC ruled that eight of them were clearly "political" in nature, and thus the cost must be separated from normal costs for rate base purposes.

Major effect of the order was only to require that the costs come out of the profits which would be used for dividends, and thus the stockholders rather than the consumer would pay the bill. The decision probably stems in large part from the continuing controversy over the FPC's role in the celebrated Dixon-Yates case, in which the charge has been made that the FPC supported the private power companies in conflict with the government's power producing plans.

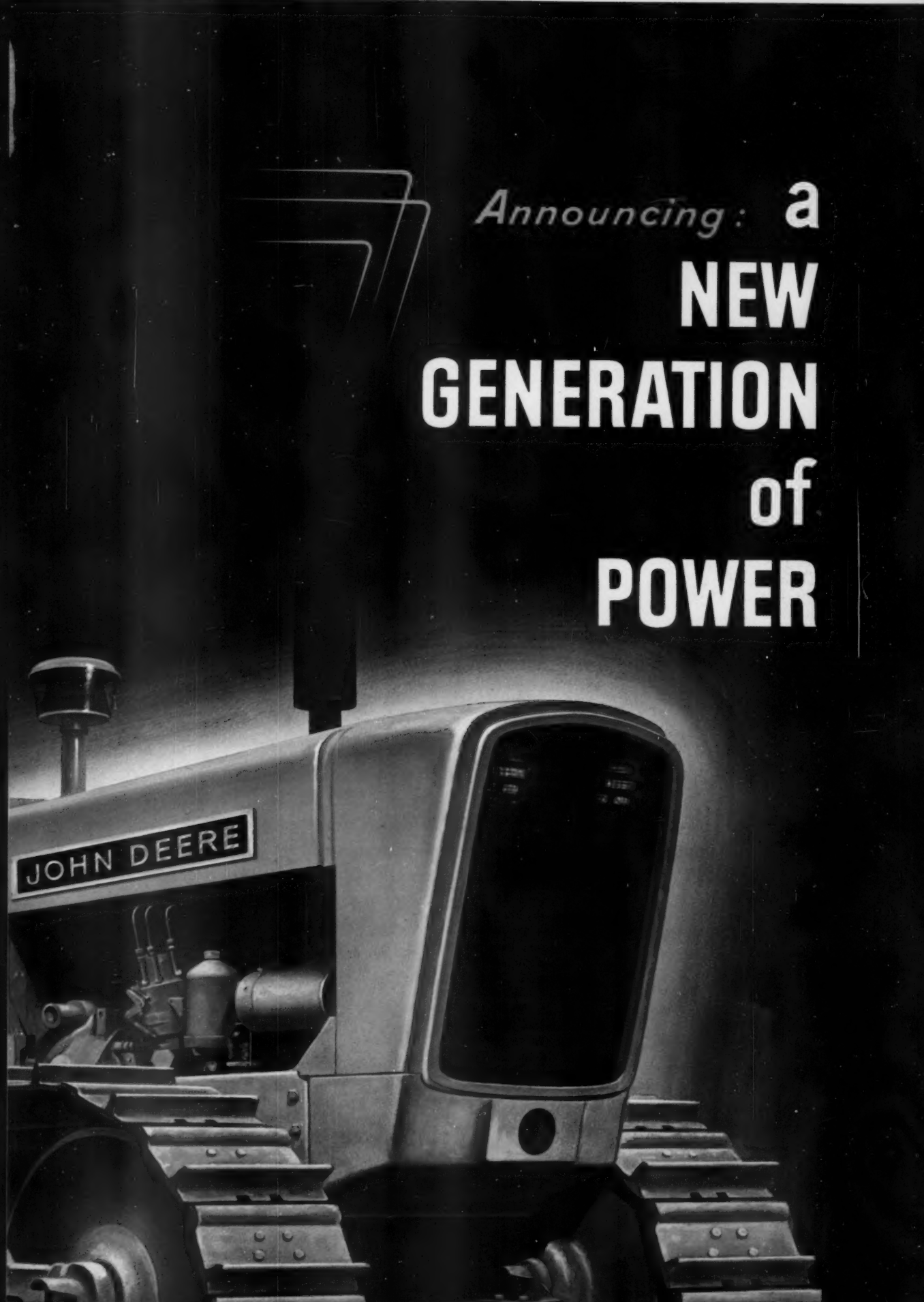
A study of the older ICC gives a frightening preview of what the gas industry may expect in the years ahead from the FPC if it follows the regulatory agency trend. At ICC, railroad and truck companies are hopelessly and helplessly mired in a slippery bog of almost unintelligible rules, regulations, restrictions, and conflicting orders and decisions. The ICC was established before the turn of the century to regulate the then runaway monopoly tendencies of the railroad empire builders. Although the railroads are now near disaster, the agency still operates as though trucks and waterway competition does not exist.

For the more recently developed trucking industry, the agency is using the same antiquated regulatory philosophy to prescribe everything from necessary safety equipment to imposing unrealistic and probably unworkable reporting requirements for accidents in which the truck does not even have to be involved.

As in the gas industry, and probably all other regulated industries, the small operator often is near—or into—bankruptcy while waiting for a slow-moving, imperious insensitive bureaucracy to reach its regulatory eruption.

THERE'LL be no quick construction of Tennessee Gas Transmission Co.'s proposed new line from

Turn to page 25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POWER
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a NEW GENERATION

1010 · 2010 · 3010 · 4010 Tractors

New tractors and attachments! New ideas in design and manufacture! Six completely new tractors, ranging in size from 40 to 85 engine horsepower will be offered with the Ten-Ten series first off the line. New tractor loaders, bulldozers, backhoes, and a variety of other equipment give the fleet owner and single-unit operator more to work with . . . more to profit by.

John Deere engineers threw away the book to bring you these new power units. Years of research, development, and testing have combined the best proved engineering principles with some of the freshest ideas in the industry today. The New Generation of Power is here!

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More usable horsepower in each tractor size—that's the advantage earthmoving contractors, pit operators, landscapers, and construction men will find in Deere power. More usable horsepower means more work per dollar invested. Coupled with fresh engineering approaches on operator efficiency, comfort and convenience, you'll speed production on a wider range of jobs.

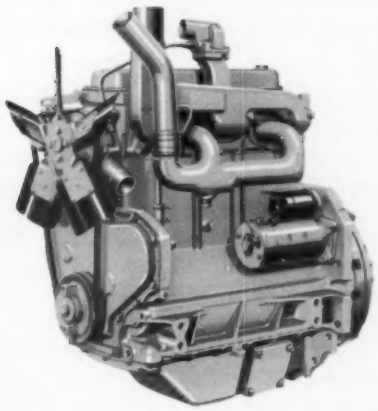
Balanced Performance

John Deere power—usable power—is day-in, day-out performance. Tractors, engines, transmissions are quality-made for full-day productivity, day after day, on job after job. Their hydraulic systems are pressure-stressed to handle continuous maximum loads without fatigue. In every respect, you can count on cost-cutting performance in this New Generation of Leaders.

# of LEADERS

New power for profit

with John Deere's wide-range power concept



Gasoline or Diesel • 4 or 6 cylinders

Completely new tractor engines, Deere designed and built, provide a new kind of performance—wide-range power—for every construction use. True variable-speed engines offer flexible, efficient power throughout the full throttle range. Coupled with transmissions providing a wide range of application-matched speeds, these new 4- and 6-cylinder engines put the new John Deere power train far ahead in horsepower efficiency, lugging ability and balanced performance.

There is big news in hydraulic power, too. Pump designs include an advanced type new to the earthmoving industry. Plenty of pump capacity, plenty of smooth, responsive hydraulic power insures efficient operation on every job.

Choose from 2 new Crawler Loaders or

For any application *. . . Excavating, loading, material handling—name your job, and you'll find the right unit for it in the all-new John Deere loader line. You'll gain new operator efficiency, too, with improvements such as one-lever boom and bucket control.*

Powered right for high performance, the John Deere Ten-Ten Crawler-Loader meets all modern demands for a versatile, efficient unit in the 40 engine h.p. class. Sixty-six inch bucket has a rollback of 40 degrees, 8500 pounds breakout force, a full-height lifting capacity of 3500 pounds, and a dumping clearance of 8 feet, 1 inch. The Ten-Ten Crawler-Loader has a 3/4-yard bucket with 8 nodular iron teeth and is available with gasoline or Diesel power.

With extra capacity for top production, the all-new Twenty-Ten Crawler-Loader combines the 50-h.p. John Deere gasoline engine with a one-yard bucket. Fast cycle time is assured by the 40-degree rollback of the 66-inch bucket, 8500 pounds breakout, 3500-pound full-height lifting capacity and a 7-foot, 11-inch dumping clearance. Eight nodular iron bucket teeth speed excavating work in rock, frozen ground or other difficult operating conditions.

4 Wheel Loaders for greater job profits

A wide range of power matched bucket sizes, each with plenty of dumping height and pry-out power assures you the kind of loading performance you need. Whether your job calls for tracks or wheels, choose John Deere for new power and high productivity.

Valuable on any job, the compact 701 Loader for John Deere Ten-Ten Wheel Tractors has a standard 3/8-yard bucket, four feet in width, with a 20-degree rollback providing 4800 pounds of breakout force, 2000 pounds full-height lift capacity, and a dump clearance of 102 inches.

Low-cost loading is yours with the economy priced 700 Loader which mounts on either Twenty-Ten or Thirty-Ten Wheel Tractors. Bucket size is 5/8 yard. Breakout force is 4800 pounds, full-height lift 2000 pounds and maximum dumping clearance, 102 inches.

Single-lever control on the 720 Loader for Twenty-Ten and Thirty-Ten Wheel Tractors speeds operation. The 720 Loader has 6650 pounds pryout pressure, 3500 pounds full-height lift effort, and clears 99-1/2 inches for dumping. Buckets are 5/8 and 7/8 yard.

30-degree rollback gives the 740 Loader for the Forty-Ten Wheel Tractor 6650 pounds of pry-out. Bucket capacity is 7/8 yard and lift effort, 3500 pounds at full height. Dump clearance is 99-1/2 inches. The loader frame is designed to accommodate rear-mounted backhoes.

Increase trenching versatility

with a John Deere 50 or 51 Backhoe

Team the new power, handling ease and mobility of John Deere Tractors with the field-proved performance of either the 50 or 51 Backhoe! You'll take advantage of every benefit of John Deere's new advances in engine power and hydraulics, plus the greater trenching versatility these units provide. Ease of operation and quick adaptability to working conditions are your assurances of low-cost trenching for soil pipe, foundations and cable laying.

2-Lever Control. Efficient 2-lever control of boom, dipper stick, and bucket, a widely preferred feature on John Deere Backhoes during the past two years, is yours again with any backhoe combination in the line. Eliminates excess hand motion throughout a long working day; helps operator do fast, precision work.

5-Position Digging. The John Deere 51 Backhoe digs flush right or left against walls, fences or buildings. The rotary boom cylinder centers or slides to any of four off-center positions along the mounting, moved by the unit's own hydraulic power. One man with a wrench easily makes the switch in minutes right on the job.

Take your pick from 5 all-job crawler bulldozers

Need a blade for heavy pioneering, road building, or precision finish grading? John Deere has it! Five outside- or inside-mounted dozers, sized right and power matched for your needs, are included in the new line. All-hydraulic models with power tilt, angle, and cut are now operated by new single T-bar control. Operator moves control to the position he wants and the blade repeats the motion! Just one of many new ideas throughout the whole line!

For clean work at low cost, select the John Deere Ten-Ten Crawler with 610 inside-mounted Dozer. Available with 72-inch or 90-inch blade with three-piece cutting edges. Angles 18 and 25 degrees right or left, cuts to 12 inches below track level, and lifts as high as 40 inches.

Power plus flexibility is yours with the John Deere Ten-Ten Crawler and all-hydraulic 612 Dozer. Change tilt, angle or cut on the go with one control! Inside mounted, with 80-inch blade.

For big work savings, the 624 outside-mounted Dozer mounts on either the Ten-Ten or Twenty-Ten Crawler. Blade is 90 inches wide, 23 inches high with three piece cutting edge. Cuts as deep as 12 inches below track level, and is easily set to angle 25 degrees right or left. Lift is 48 inches.

Pair the extra power of the Twenty-Ten Crawler with new inside-mounted 620 or 622 Dozer. Choose from 72-, 80- or 90-inch blades with hydraulic lift or full hydraulic operation.

Dependable John Deere diesel power, teamed with a versatile elevating scraper, provides a widely preferred earthmoving combination for road and street work, land forming, and stripping overburden.

PARTS and SERVICE

Parts and service for any John Deere Tractor are always available from your nearby John Deere dealer. He and his service crew know how to service and maintain construction equipment with minimum downtime expense. Find out how this man can help you now. Check with the classified telephone directory or write John Deere, 3300 River Drive, Moline, Illinois.

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All tractors and equipment can be purchased on terms of the John Deere Credit Plan. Arrangements are made in strict confidence by your dealer. Terms are tailored to individual requirements. Protective life insurance and property insurance are also available at low cost.

LEASING PLAN

Throughout the United States, three to five-year leasing arrangements can be made through your John Deere dealer. The plan is specifically designed to enable contractors and others to obtain profitable use of the most modern, efficient equipment, without affecting needed working capital.

JOHN DEERE Earthmoving Logging Landscaping and Material Handling Equipment

JOHN DEERE

Texas to southern California through Mexico.

Speculation that the line will be outside Federal Power Commission control may eventually prove true. But it will take lots of lengthy argument before the FPC and probably some courts before the issue is decided.

Completeness of the federal government's control over the natural gas industry will again be pointed up by the TGT proposal.

The $200 million line is proposed to run from a connection with existing TGT facilities at the Texas-Mexican border near McAllen, Tex., run through Mexico to the California border at Mexicali, and on to Los Angeles. The line would run about 1200 miles, most of it in Mexico. The Mexican portion would be built by the Mexicans but operated by TGT. Capacity is set at 750 MMcfd.

Possible freedom from FPC control is based on the fact that the American portion of the line never crosses any state lines, and therefore could be considered not in interstate commerce.

But government bureaucrats are already building up ammunition to fight this contention. FPC—which continually insists it wants the least control power possible — is prepared to fight to gain certification powers over the proposed line. A "confidential" memo giving the basis for control was prepared even before the company officially confirmed it was considering the line.

Principal basis for the FPC contention that it will control the line is an executive order from the President delegating to the FPC his power to issue natural gas export and import permits. FPC spokesmen say they would hold hearings under this authority, forcing the company, in effect, to go through a certificate proceeding.

The export and import certificates (export of Texas gas into Mexico, where it would be mingled with additional gas from the Pemex supplies, and imported into California) would be signed by the President. FPC would recommend to him whether or not they should be signed, and chances are that any President would follow the recommendation.

Undoubtedly, price, rate of return, and similar facets of the project would be considered by the FPC before making its recommendation.

In addition, FPC spokesmen also say they believe the commission could legally insist on issuing a certificate both for the Texas connection and for the California line, even though both are within only one state each. Basis for this assertion is that the lines are in foreign commerce.

Many gas lawyers argue that the FPC does not have authority over lines in foreign commerce — only those in interstate commerce. The FPC lends some weight to this contention in its annual request of Congress to amend the Natural Gas Act to "include foreign commerce within the coverage of the act and define persons engaged in the importation and exportation of natural gas as 'natural gas companies' so far as their operations in the United States are concerned."

But FPC says it has under existing law enough power to attempt to certify the line, and leave it to the courts to make a final ruling.

The U. S. State Department has already been brought into the proposal. Spokesmen for the company testified at a California PUC hearing that they talked to officials at the Department, and that these officials favor the line. However, Department spokesmen will say only that they have no authority to approve or disapprove such a line, and would make any comments on the proposal only when asked by the power commission during its consideration of the export-import permits.

Any hearings by the FPC on the project, either for permits or certification, would undoubtedly attempt to uncover details of the Mexican section of the line, even though it would be owned by a foreign government. This would be done by requiring the American company to produce the information as part of its rate base structure.

A now-discarded attempt to dig into the operating figures of Canadian producing companies by the FPC in the Pacific Gas Transmission Co. case stirred up this country's northern neighbors, and would probably also bring cries from south of the border.

GAS industry will probably get some hard thumps from an evil-tempered Congress next year as Democratic leaders try to make up for the frustrations suffered during the abortive Kennedy-Johnson rump session this summer.

Whatever the outcome of the race for the White House, the Democrats are certain to retain control of the Senate and probably the House as well. Thus the same leadership that failed to fulfill any of its campaign promises in the August session will be back at the helm next January. They'll still be smarting from the failures to control their two-to-one majority and pass the bills they had so glibly promised during the convention.

Win or lose in the Presidential race in November, the Democrats have lots of political ground to make up—and promises to make good on to such backers as the AFL-CIO.

For the gas industry, this could mean passage of several bills which it has opposed successfully for several years.

It also undoubtedly will spell certain defeat for renewed efforts to draft another natural gas bill, now gaining a full head of steam among producers.

Two of the most likely are reduction in the depletion allowance and steps leading to a national fuels policy with end use controls over natural gas.

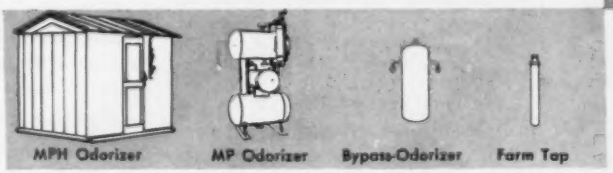
The depletion allowance has come under repeated attack in the Senate in recent years, with proponents of cutting the figure sharply from the present 27½ per cent gaining some ground. Their failure to win in the past has been due partly to a lack of interest by legislators, with most votes totaling only about two

Continued on page 200

Over 1200 Peerless Gas Odorizers in service...

Peerless puts the right smell in gas . . . from the largest odorizer to bypass or farm tap.

Heart of the largest Peerless meter type MP Odorizers is the internal mechanism shown at the right . . . pump revolution counter and liquid level gauge make sure of constant odorizing rate regardless of variations in flow, temperature and pressure. The skid-mounted odorizer station type MPH, in the illustration above at right is a complete packaged unit . . . quickly installed and ideal for locations where no noxious odors are permitted. For small loads there are the Peerless units shown below . . . including bypass odorizer and farm tap. For *all your gas odorizing needs* get in touch with your nearest Peerless Representative today.



Peerless Internal Mechanism above provides accurate control of odor into the gas stream. Unit is sealed in central vessel of Peerless Odorizer between odorant storage and safety tanks. Tempered glass windows in "O" Ring closure provide visibility to counter and gauge.

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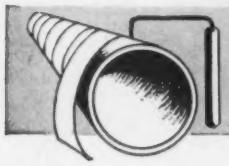

Some more popular superstitions

BY MARSHALL E. PARKER

Consulting Engineer
Houston

LAST month we listed six popular superstitions connected with corrosion and the measures we take against it, and discussed five of them. They are:

(*1*) *A pipeline can be "insulated" from ground.*

(*2*) *A coated pipeline can be "grounded."*

(*3*) *Water can short-circuit an insulated joint.*

(*4*) *A grounded structure is at ground potential.*

(*5*) *Electricity follows the path of least resistance.*

(*6*) *Copper is the best commercially available conductor.*

The truth or falsity of the last statement depends on the definition of the expression "best conductor." Of course, everybody knows that silver is the best conductor, with copper a close second. But this is true only if we define conductivity in terms of the cross-sectional area. In other words, for a given length and resistance, the *smallest* conductor would be made of silver, and the next smallest of copper.

But if we start looking for the *lightest* conductor of a specified length and resistance, we will choose aluminum (unless there is another light metal, more expensive than aluminum, but an even better conductor; this has not been checked). The power industry shows its recognition of this by using large quantities of aluminum cable; after all, it is the weight of a cable which has to be supported, not its area. And at high voltages, the increased diameter becomes a positive advantage, for it decreases the corona loss.

However, suppose we become economy-minded, and specify that our selected conductor is to cost the least possible amount. Then we should make it of steel. After all, the IR drop in a one-ohm steel conductor is exactly the same as in a one-ohm conductor of copper, or of silver, or aluminum, or any other metal. So long as we deal with steady dc currents, we couldn't even tell the difference by measurements. (The hysteresis losses for ac would be higher, because steel is a magnetic material.)

Even more important than the mere fact that conductivity can be defined in more than one way, or that different choices of definitions lead to different choices of material, are some of the consequences of belief in the basic superstition that copper is the best conductor. This belief is so firmly entrenched in many quarters that it leads to the conclusion, "if it has to carry current, it has to be made of copper." This viewpoint is responsible for the presence of copper in a number of places where it is not really needed, and where it is a distinct nuisance to everybody concerned with corrosion.

These places are most frequently in electrical grounds. Because these are to carry an electric current—not often, it is true, but it is their primary purpose—it is assumed that they have to be made of copper. They are connected to everything in sight—conduits, pumps, valves, machines—and thus are inevitably connected to the piping which some corrosion engineer is trying to protect. These copper grounds, composed of driven rods and their bare connecting cables, are a trial to the corrosion engineer in two ways: First, they will form, with the steel of the piping, a galvanic cell which is capable of viciously attacking the steel. Secondly, when the attempt is made to put the piping under cathodic protection, the bare copper, with its much lower potential, soaks up protective current like a sponge. As it is interconnected with the piping, it must be brought up to the potential which is protective to steel in order to bring the steel up. Doing this means supplying each square foot of bare copper with up to five times as much current as is needed by a square foot or bare steel—which may mean as much as 5000 times as much as each square foot of coated steel!

The answer to this? Steel grounds. It has been done, and with excellent success. One large steel plant has extensive steel grounds, interconnected by *insulated*, not bare, copper cables; there is not a square inch of bare copper in contact with the soil. The steel grounds are protected from corrosion by being connected to a system of magnesium anodes. (Ordinary copper grounds are protected from corrosion by being connected to steel anodes, in the form of the piping somebody is worrying about.)

The grounds referred to above are those connected to an electrical power system; they have to be of large cross-section and low resistance, because their function is to discharge to earth fault currents, which may run to 30,000 amperes or more, *without developing a*

Continued on page 199

a little pot
of soapy water
tells you all
you need to
know

It's easy to test the tightness of your pipe joints when you make connections with Dresser Couplings and Fittings. All you do is "paint" the joint with soapy water and check for bubbles. That's all. No X-Rays, no elaborate equipment, no multi-step inspection process. Controlled quality standards maintained under ideal factory conditions pre-assure soundness, eliminate porosity, other possible joint defects. Thus the soap test merely confirms proper installation. Make soapy water your inexpensive test device — specify Dresser with confidence.

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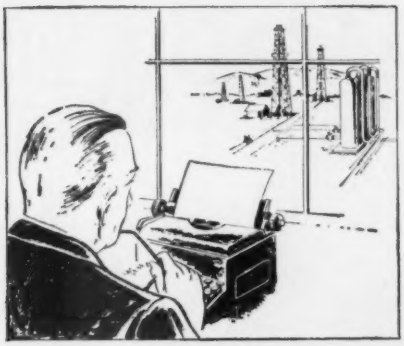

THE GASSING GAME

By **JIM CLARK** • Gas & Oil Consultant, Houston

WITH the petroleum industry in Texas already paying well over half of all the taxes in the state, the state administration is today considering several new and expanded taxes on oil and gas.

Recently a committee of the Texas Mid-Continent Oil & Gas Association made a 54-page analysis of the overtaxation of the industry and its effect on the public in Texas. This included the fact that since 1957 employment in the petroleum industry in Texas had shrunk by 21,200 jobs and that the industry certainly needed no new taxes to further burden it and force additional curtailment.

This is Texas, of course, where most of the natural gas comes from. And some of the most important new taxes being considered at present are on the natural gas end of the business. For instance, the 1.5 per cent severance beneficiary tax (which one court has already held unconstitutional) would be doubled to 3 per cent under one proposal. This would be in addition to the present 7 per cent production tax and the normal ad valorem tax which is already being collected.

Then there is another new tax under consideration. That is a 1-cent-per-Mcf tax on gas processing. The Texas Mid-Continent report shows that such a tax would be discriminatory on manufacturing and could actually cause the shut down of many plants which conserve gas that comes up with oil—gas that would otherwise be lost by flaring. The tax would obviously place Texas gas processing plants at a disadvantage with those in other states. Its other disadvantage to the state is that it would discourage the construction of new petrochemical plants which consume gas as a key raw material.

And in spite of the fact that the present one-fourth of one per cent gross receipts tax on pipeline companies is in litigation, there is a proposal that this tax be increased. There is also a proposal to increase the state franchise tax on oil and gas companies in spite of the fact that this type of tax has been increased 275 per cent since 1950 in Texas and has already provided some $58 million in revenue for the state in 1960, with at least a third of the year still to go.

Well, that is just a picture of the tax bite potential in Texas, the home of about half of the natural gas in the country. Any or all of these taxes could seriously effect the natural gas industry, including producers, pipelines, and distributors. But most of all it would fall, eventually, on the consumer.

But as bad as all of this might sound to the people concerned outside of Texas, it is really not as bad as it seems. For instance, the Texas Mid-Continent Oil and Gas Association, which is fighting all of these proposals, is an organization of influential Texans who are armed with excellent economic arguments.

In the second place, Texans are proud of their petroleum industry. They appreciate the tremendous contribution it makes not only to the state in the way of taxes, but, more important, to labor in the way of individual income, and to business in all fields, as well as to thousands of landowners on whose properties some of the almost 200,000 wells in some 6000 fields exist, plus the added additional thousands who receive bonuses and rentals on land still unproductive. Also, the smaller taxing units such as the school, drainage, port and other districts, know that further additions to petroleum taxation will endanger their positions since they all tap the industry for something.

The best hope, however, lies with the ordinary citizen, who was polled some months ago by a highly reputable and reliable organization, and expressed himself as more or less unalterably opposed to putting any more of the tax burden on the state's most important industry, especially at a time when the industry is in an economic trough.

On the other hand, Price Daniel, the governor, was re-elected for an unprecedented third term on a platform of more taxes from somewhere, and he openly opposed broad based taxes such as income and general sales taxes. His only opposition was an inexperienced candidate in his first statewide race who campaigned vigorously for a general sales tax. Texas is not quite ready for a general sales tax, so it gave Daniel's opponent less than 45 per cent of the vote.

Anyway, these are just a few things gas people all over the country should know about what to expect in the way of trouble from taxes in Texas.

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*Size 3M125 ½ actual size

Gas men who've previewed it are mighty excited about the cost saving features of the new Roots-Connersville 3000 cfh rotary gas meter. Only 14" long, a workman can pick it up with one hand and carry it under his arm.

Because it incorporates the famous Roots rotary positive displacement principle, accuracy is permanently locked in for the long, trouble-free life of the unit. Actuated by the gas flow itself, twin rotors displace a fixed volume of gas with each revolution, unaffected by variations in pressure or flow. Extremely close clearances between rotors assure accuracy while eliminating all friction and need for internal lubrication. Occasional replenishing of oil is the only maintenance required under normal operating conditions.

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lifetime pipeline markers and sign posts . . .

Never need painting. Won't rust or shatter!

This new, non-metallic* pipeline sign post saves money three ways. Chemically bonded color eliminates painting maintenance. The posts are light and easy to handle and store, come conveniently packaged 5 to a container. And they're sturdy, even gun shots won't shatter them.

Equally important, both pipeline markers and sign posts can be designed to meet your specific requirements. Marker posts and side-mounted sign posts may be equipped with cathodic terminal caps or vent caps. Climbers may also be added.

A 5" square foot piece is solvent-welded to the bottom of the post to prevent rotation. It anchors the post securely in the ground.

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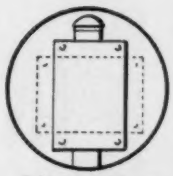
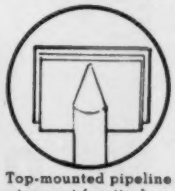


Side-mounted sign, (vertical or horizontal). Front view shown above.



Top-mounted pipeline sign post (vertical or horizontal). *Rear view shown above.*

Marker Post with cap

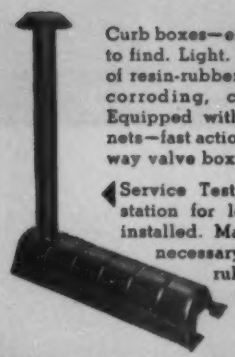
Marker Post with vent cap

Cathodic terminal cap for pipeline marker post

End call backs with attractive HI outside meter boxes. Available as shown, or for recessed installation. Made of tough resin-rubber compound*.

Master Poly-Trol *automatic* gas shut-off valve. Shuts-off gas in event of over-pressure, underpressure, excessive high temperature, and flooding. Serves also as a tamper-proof manual shut-off.

HI Cathodic Terminal Box Landscape engineered, and non-corroding*. Leads are attached to the terminal block in the cap for easy testing.



Curb boxes—extension-type. Easy to find. Light. Tough. Safe. Made of resin-rubber compound*. Non-corroding, collapsible type. Equipped with permanent magnets—fast action on finders. Roadway valve boxes also available.

Service Test Station. Provides a test station for leak surveys. Permanently installed. Makes random probing unnecessary. Made of tough resin-rubber compound*.

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Post Diameter: 3½"

Wall Thickness: 3/16".

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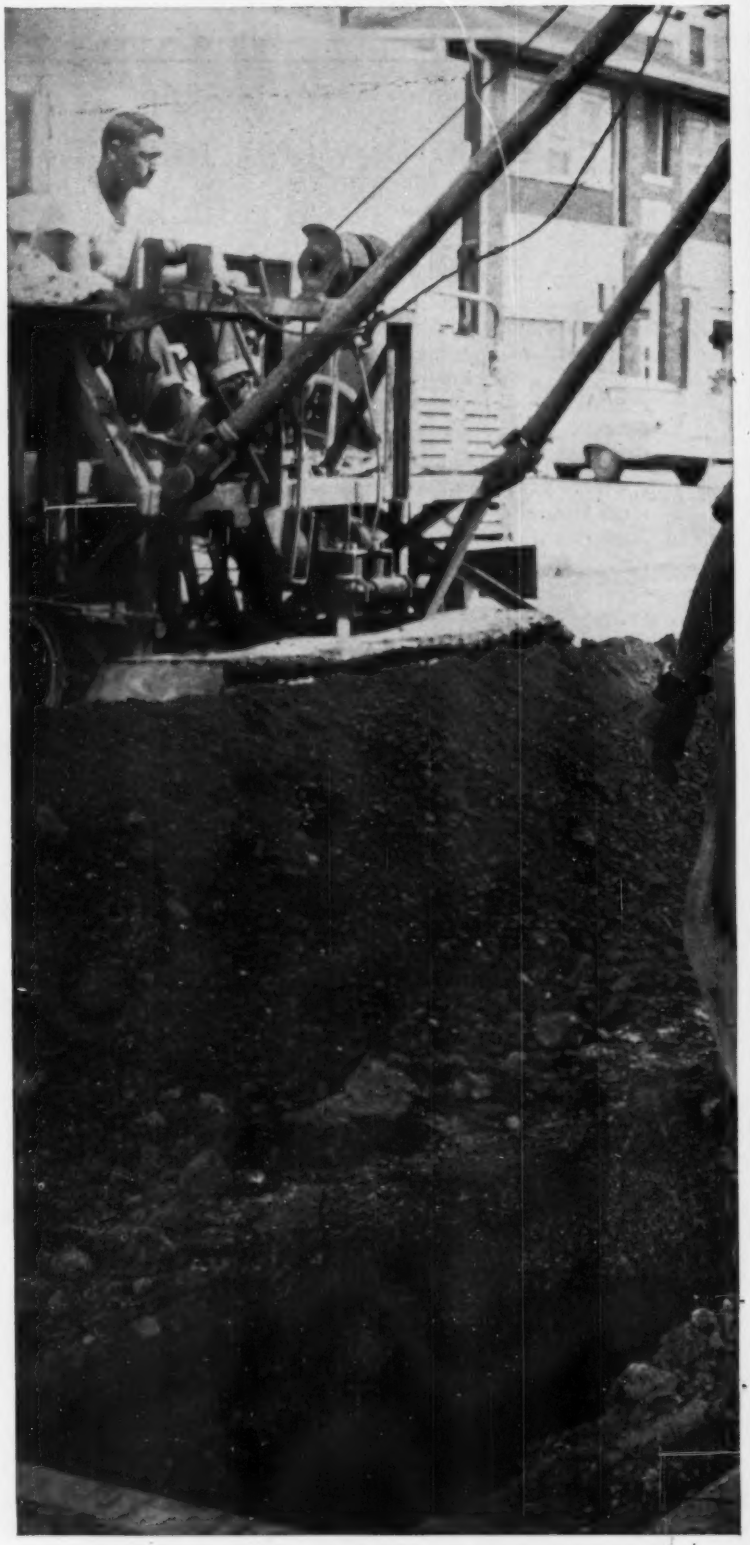

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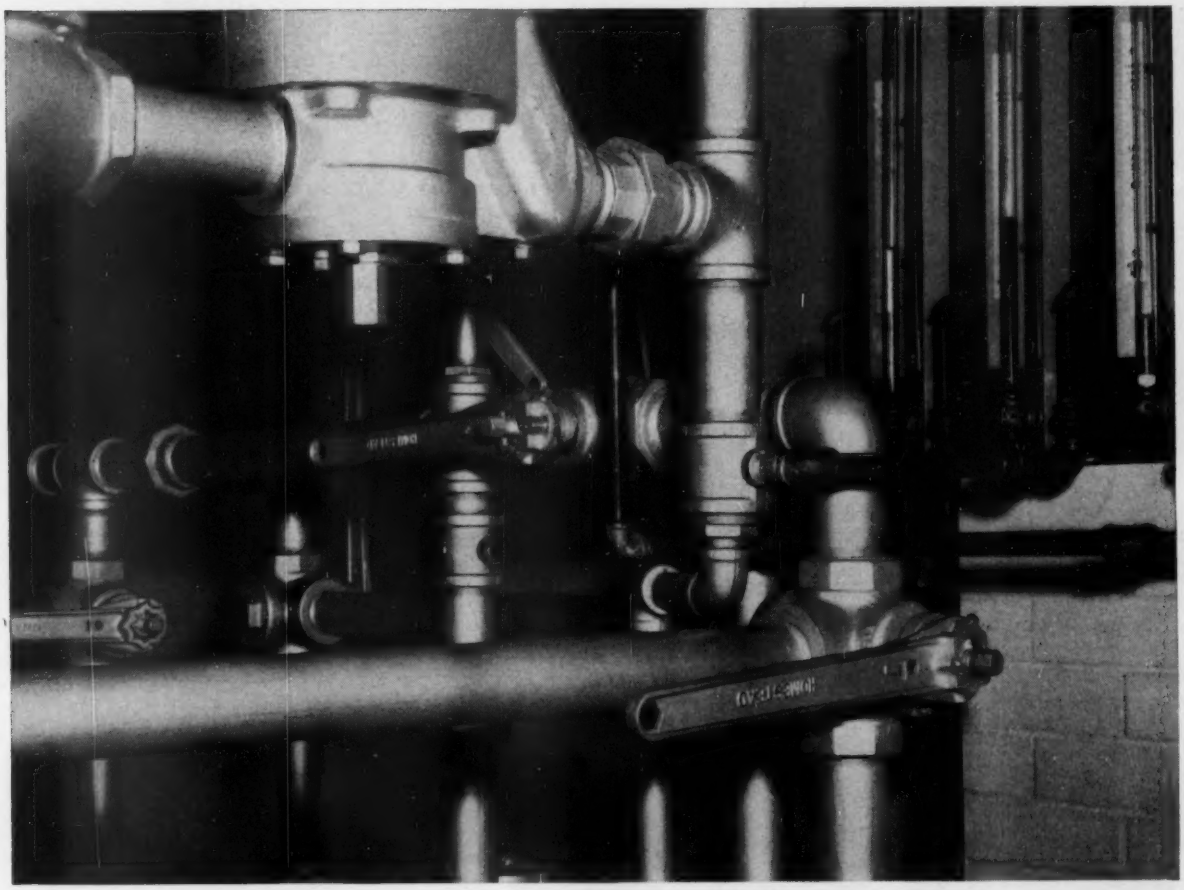

(.002″ maximum clearance on sizes up to 2″, .003″ to .005″ maximum on larger sizes) plus Homestead's high-pressure lubricant system guarantee complete coverage of sealing surfaces. You are assured protection against corrosive, abrasive or erosive line fluids as well as a longer-lasting seal against leakage. Sticking is eliminated, too, by downward movement of plug during each lubrication. The net result for you is positive fluid control at very low cost per year.

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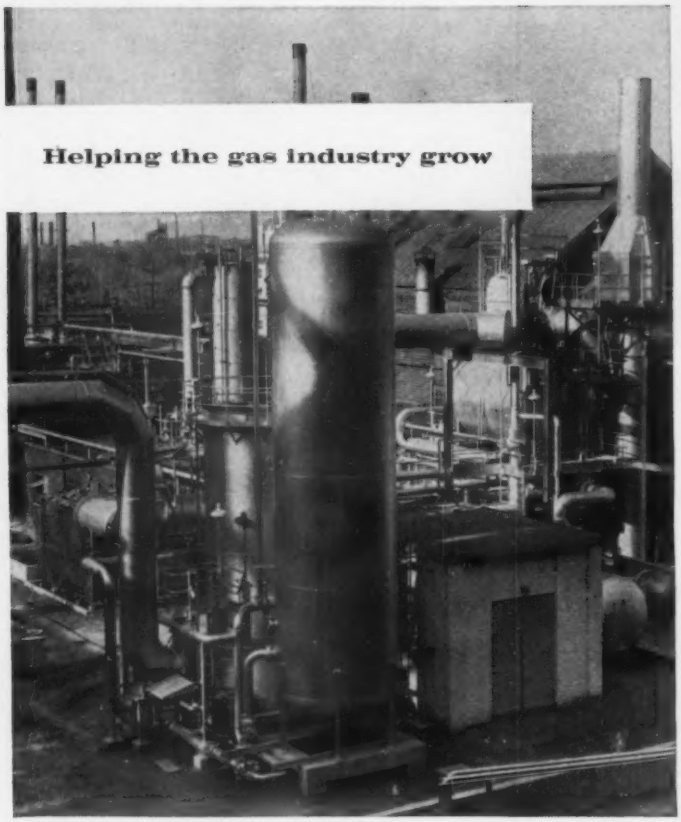

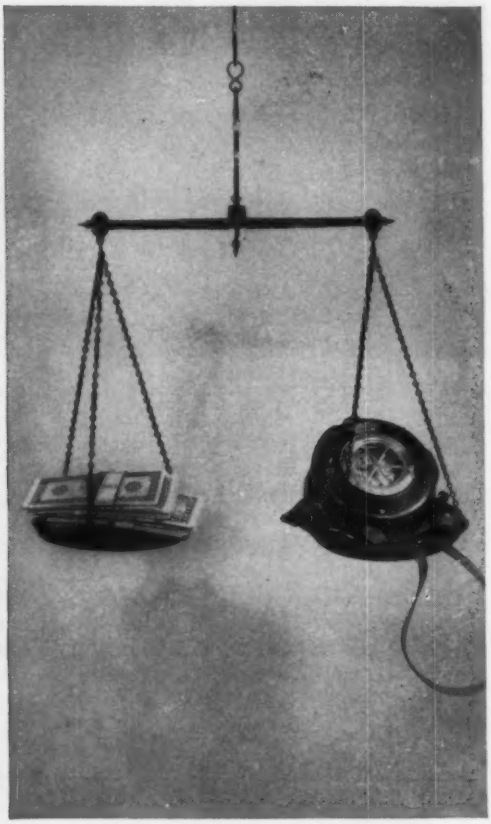

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Each tee is tested to 5,000 p.s.i. hydraulic pressure, and carries "Rated 1,000 pounds". A 5 to 1 safety factor. Made from steel similar to pipe, it welds easily, and in the saddle model, takes a perfect thread.

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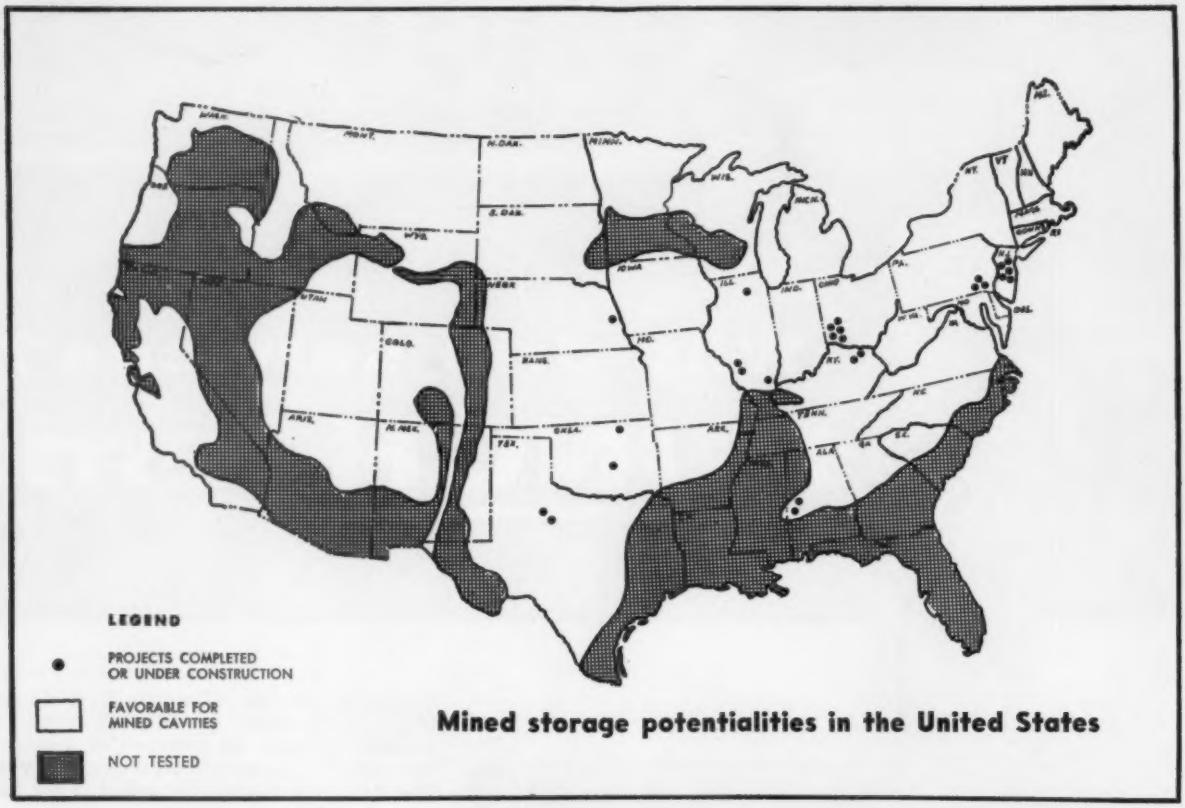

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Breckenridge, Texas	20,000	1950	Shale
Breckenridge, Texas	30,000	1952	Shale
Aurora, Illinois	50,000	1953	Shale
Crossville, Illinois	50,000	1953	Shale
Sinclair Oil & Gas Company			
Seminole, Oklahoma	110,000	1954	Shale
Tuloma Gas Products Co. & Sinclair Oil & Gas Company			
Demopolis, Alabama	140,000	1956	Chalk
Demopolis, Alabama	225,000	1956	Chalk
Esso Standard Oil Company			
Linden, New Jersey	150,000	1957	Shale
Linden, New Jersey	150,000	1957	Shale
Linden, New Jersey	100,000	1958	Shale
Linden, New Jersey	125,000	1958	Shale
Linden, New Jersey	150,000	1959	Shale
Sun Oil Company			
Marcus Hook, Pa.	250,000	1958	Granite
Marcus Hook, Pa.	400,000	*	Granite
Marcus Hook, Pa.	250,000	1960	Granite
Columbia Hydrocarbon Corporation			
Siloam, Kentucky	210,000	1959	Shale
Siloam, Kentucky	85,000	1959	Shale
Texas Eastern Transmission Corporation			
Middletown, Ohio	160,000	1959	Shale
Middletown, Ohio	210,000	1959	Shale
Middletown, Ohio	135,000	1959	Shale
Middletown, Ohio	165,000	1959	Shale
Middletown, Ohio	200,000	1960	Shale
Shell Oil Company			
Wood River, Illinois	500,000	1960	Limestone
Wood River, Illinois	250,000	*	Limestone
Metropolitan Utilities District			
Omaha, Nebraska	150,000	1960	Shale
Continental Oil Company			
Ponca City, Oklahoma	300,000	*	Limestone
TOTAL	4,565,000		

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William Cunningham, Plant Manager, with Earl Hudson, General Manager, DuBois, Pa. meter manufacturing operations.

Rockwell aluminum meters are numbered according to their capacity ratings. From left to right above: Nos. 10,000, 5,000, 3,000, 1,600, 750, 415, 310, 250, 150 and LPG meter.

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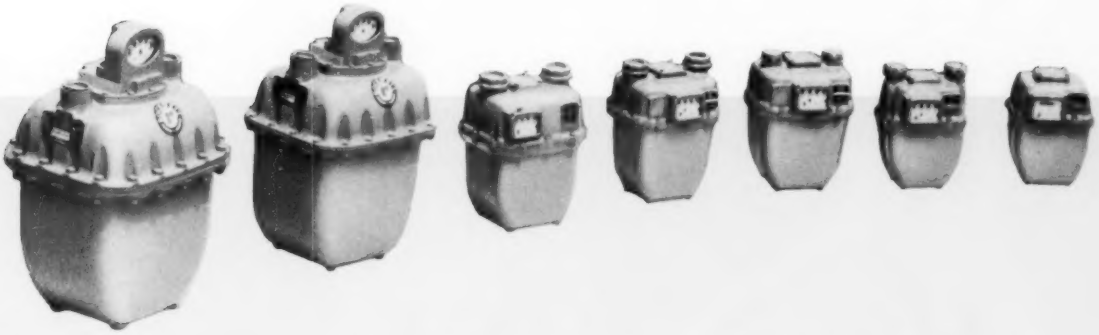
THE ONLY COMPLETE LINE OF SINGLE JOINT ALUMINUM METERS



How you benefit

Rockwell alone can offer you a complete line of aluminum meters. They are graduated in size and ratings to suit your every requirement.

With these meters you'll gain the safety and convenience of single joint construction. Their light weight makes them easier to handle and install and more economical to ship. Your meter shop operations will benefit from the economy and simplicity of repair procedures resulting from the removable and interchangeable valve plate construction. Rockwell improves your shop storekeeping too, by publishing a list of parts common to all meter sizes. Write for sales and service bulletins.

ALUMINUM GAS METERS

another fine product by

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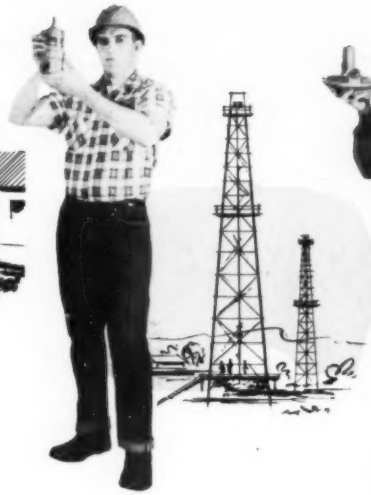
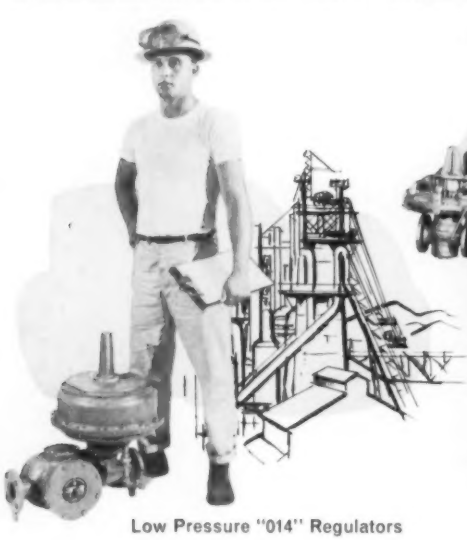
High Pressure "015" Regulators



Field Regulators

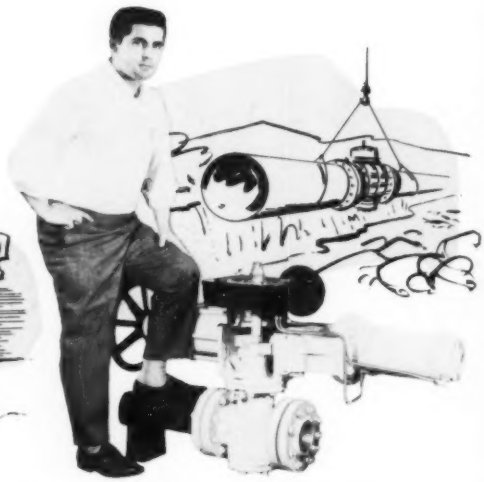
Service Regulators

PRODUCTS OF RESEARCH THAT BENEFIT YOU



Low Pressure "014" Regulators

"1001" Multi-purpose Regulators



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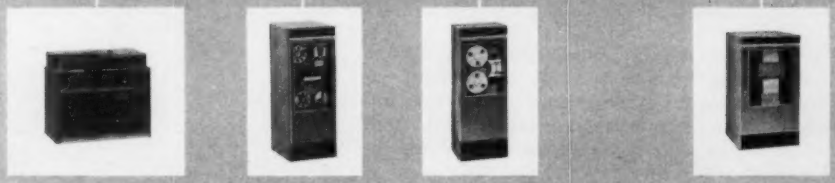
MEANS PRACTICAL EXPANDABILITY IN

BALANCE WITH APPLICATION GROWTH



Just as the organization chart of any enterprise provides the framework for dynamic growth and adaptation, so "organization chart" design provides the framework for unparalleled expandability in the Bendix G-20 data processing system. This means that your G-20 can economically match, step by step, your expanding scientific or business computational workloads ... without sacrificing system balance. • Key to the organization chart efficiency of the Bendix G-20 is the ability of the Central Processor to "delegate" routine data handling tasks to control buffers, acting as "line supervisors." Thus freed, the Central Processor can make most efficient use of its high computation speed, its ability to schedule program priorities and direct accessory equipment assignments. • The ability to employ many control buffers gives new meaning to expandability in the Bendix G-20. Up to 70 input/output units can be directed by each of these "line supervisors." The Bendix G-20 has a complete line of accessory equipment including keyboard, paper tape, punched cards, high speed line printers, and 2 million word magnetic tape units. • Memory represents another dimension of G-20 expandability, ranging from 4,096 to 32,768 words. • Investigate the organization chart design of the Bendix G-20. See how it provides balanced, *practical* expandability ... at a cost that assures unequalled data processing performance per dollar invested. • ***For detailed literature write:***

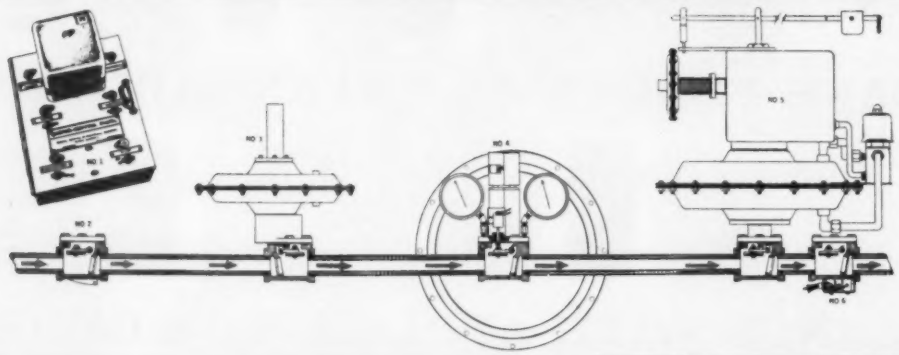
Bendix Computer Division
DEPT. AN-27 LOS ANGELES 45, CALIF.

THE Bendix CORPORATION

FROM GAS SUPPLY TO BURNER

BUTTE BRASS FULL FLOW GAS VALVES

Maximum Protection
Minimum Pressure Drop
Maximum Performance



Tested and proved in installation, Butte Brass Full Flow gas valves provide increased capacities, maximum performance and minimum maintenance and expense in every control valve situation from gas supply to burner. Versatile and varied, they require no special tools or line removal for servicing. Many standard parts for each valve. Extra safety built in. Check the features.

*CAPACITIES based on AGA RATINGS			
Drop	1"	4"	½ lb.
Size ◦ 1"	1,670	3,340	6,179
◦ 1¼"	2,432	4,864	8,998
◦ 1½"	3,820	7,640	14,134
◦ 2"	4,960	9,920	18,352
2½"	7,396	14,792	27,365
3"	12,372	24,744	45,776
4"	18,640	37,280	68,968

MORE B.T.U.'S PER DOLLAR
CHECK THESE CAPACITIES

1. **BURNER CONTROL PANEL**—pre-wired panel board has indicating lights for each unit, automatic pilot, low-water cutoff, limit switch, pre-purge and post-purge, and alarm.
2. **FLO-TROL FULL FLOW SHUTOFF VALVE** — non-lubricating type can be opened or closed with minimum of effort, no wrenches needed.
3. **GAS PRESSURE REGULATOR**—Full Flow . . . makes it possible to maintain the required pressure needed for each individual job. From 5#-2".
4. **PROTECTROL FULL FLOW**—automatic, closes on excessive high or low pressure gas, or current failure. Cannot be blocked open or opened until normal conditions exist in the valve.
5. **DEMANDTROL MAIN FULL FLOW CONTROL VALVE** — single-stage, two-stage, or throttling type. Complete combustion unit has large diaphragm to control air door, full 360° circle on air door arm.
6. **SAFETY FLO-TROL FULL FLOW SHUTOFF** — electrical inter-locking switch. Must be closed to make electric contact to control valves. Can be tested before shutoff is opened.

Butte Brass *And Controls Company*

Successor to Sullivan Valve & Engineering Co.

General Office and Plant, P. O. Box 518, Butte, Montana, Phone 5496, 5497
Branch Office and Plant, 137 Bacon Street, Waltham, Massachusetts, Phone TWinbrook 3-3800
Sales Office, 330 Del Mar Place, San Gabriel, California, Phone CUmberland 3-1986

You get a full measure of value with a Holan Gas Meter Body

Versatility is one measurement of value—and on that score the Holan 75-C Gas Meter Body really measures up.

The 75-C is built for gas meter installation—but it is ideal for delivery and installation of appliances and general service work.

Six 10-light meters ride in cushioned safety to the job. Two are stored in the left-hand vertical compartment; four are carried inside the body on a sturdy meter platform.

Like other Holan bodies, the 75-C has flush-type door handles with key locks and safety-tread steel floor.

Tubing, connections, conduit and miscellaneous parts and equipment are carried in vertical and horizontal compartments. Optional lower rear compartments are available on either or both sides.

Long lengths of pipe can be carried in the pipe rack, held securely in place with hold down clamps. A rear-mounted pipe vise bracket and folding pipe support at front make easy work of on-the-job cutting and threading.

Your Holan Field Representative would be happy to supply more details...or write us for literature.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

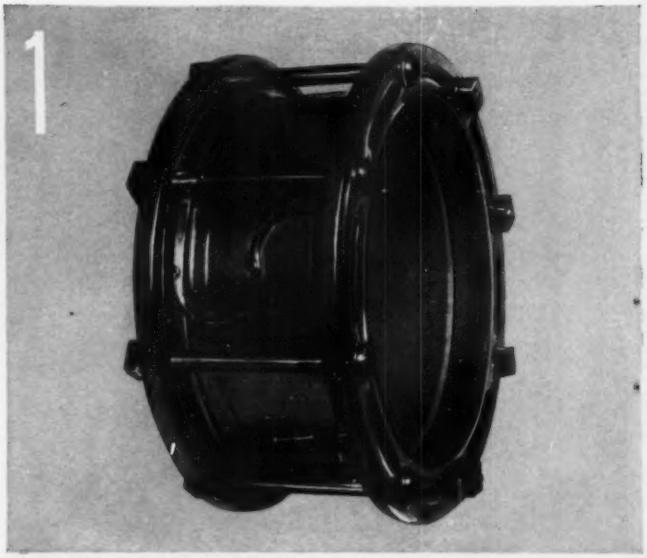
Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

6 SHORT STEPS TO GREATER SERVICE IN GAS DISTRIBUTION

1. Coupling mains and service lines is simple, effective and saves you money. Take a Dresser® Style 123 factory-assembled pre-coated coupling. Initial cost is low...but the economies just start here. 2. Now take the man who makes the joint. That's right, it takes only one man—with a minimum of instruction and supervision—to make gas tight joints with the best of them. And at the rate of 2 bolts a minute. 3. Here you see part of the reason why Dresser couplings save time in the ditch. Note the pipe being stabbed into the pre-coated coupling. The complete coupling is clad in 3 coat protection —prime, coal tar epoxy resin bonded under glossy black coal tar enamel. No mess and time wasted on coating and priming hard to get at places. 4. Tightening-up the bolts to make the actual joint is quick and uncomplicated. No precision equipment to pamper, no need for protective gear...in fact the only necessary equipment is a wrench. 5. One pan of soapy water is all that's needed to check the tightened joint. No elaborate testing devices. Just paint it on and check for bubbles. It's as simple as that. 6. Last the connection gets a quick touch-up and the joint is done...ready to "live" in the ground taking the worst that weather, ground settlement, vibration and line pressure can offer.



Dresser couplings save you money. Initial cost is low and maintenance and repair problems are simplified or eliminated. They save valuable time because they're precoated and assembled, quick and easy to install even when there's not much elbow room. Entire systems can be coupled right in the ditch with no need for tricky lowering of pre-joined lengths and the expensive equipment involved. ■ Economical gas distribution, construction and repair calls for couplings and repair products developed specifically for the gas industry. This has always been Dresser's prime business. Your Dresser man has any information you need on the complete Dresser line. Serving the gas industry is his only business, and, he is qualified, and eager to assist you in every way. DRESSER MANUFACTURING DIVISION, 61 Fisher Avenue, Bradford, Pennsylvania.

dmd

DRESSER
MANUFACTURING DIVISION
BRADFORD, PENNSYLVANIA

DRESSER INDUSTRIES, INC.
OIL • GAS
CHEMICAL
ELECTRONIC
INDUSTRIAL

SERVING THE GAS INDUSTRY HAS ALWAYS BEEN OUR BUSINESS

4

5

6

CHAPLIN FULTON

model 1100 gas regulator

modern... versatile... accurate

You can't buy, beg, borrow or steal a more versatile pressure regulator than MODEL 1100. Nor has traditional Chaplin-Fulton ruggedness, simplicity or accuracy been forgotten in this new modern design. Size —2" only, screwed, flanged 125 or 250 ASA.

WIDER APPLICATION Inlet Max.—400 psi. Outlet Range—1" to 150 psi.

GREATER CAPACITY 24,000 cfh at 10 psi to ounces; 114,000 at 100 psi. Body contoured for flow.

EASIER MAINTENANCE Regulator or pilot can be serviced without disturbing the other. Quickly accessible orifices in both, easily renewable.

SIMPLER INSTALLATION Only one connection required. No complicated pins or toggles to adjust.

You can standardize on MODEL 1100 for a wider range of your industrial, commercial or distribution installations.

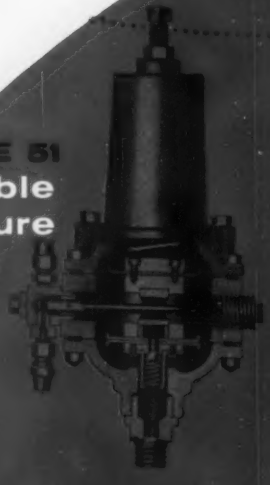
ACCURATE CP MFG CO DEPENDABLE

Write for bulletin 1100

Chaplin-Fulton

MANUFACTURING COMPANY

Pittsburgh 25, Pennsylvania



TYPE 51 variable pressure pilot

The heart of the MODEL 1100 assembly, insuring precisely accurate control over the complete flow range.

- Unitized construction—valve lever and orifice as a unit are removed from the outside, without disturbing balance of assembly. The likely trouble spot—the orifice—is placed outside where you can get at it quickly—no internal tubes to clog.
- Twin diaphragms remove as a unit.
- Internal relief unit—guards against overpressure.
- Spring unit—remove three screws to change springs.
- Built for service.
- Used for accuracy.

UTILITIES EXPECT MORE FROM

POWERS American

SERIES 460 GAS AND WATER LINE CONSTRUCTION BODY . . .

NEXT BEST THING TO HAVING NO INSTALLATION OR MAINTENANCE PROBLEMS

This body is truly a stockroom on wheels. When it arrives at the job site crewmen have all the tools, parts and supplies needed to quickly handle any routine or emergency assignment.

The quality-crafted Series 460 is available with exposed or completely-enclosed air compressor, installed behind the cab and driven by a power take-off or independent gasoline engine. Generous cargo area and specially-designed compartments, bins, trays, shelves and hooks make it easy to store and reach pneumatic and hand-operated tools, multi-size pipe, fittings, parts and bulky materials. Hose reel, backfill air hoist and water pump are optional.

Descriptive literature and prices on the Series 460 and other bodies in the Powers-American line will be supplied on request.

McCABE-POWERS BODY COMPANY

5900 NORTH BROADWAY, ST. LOUIS 15, MISSOURI

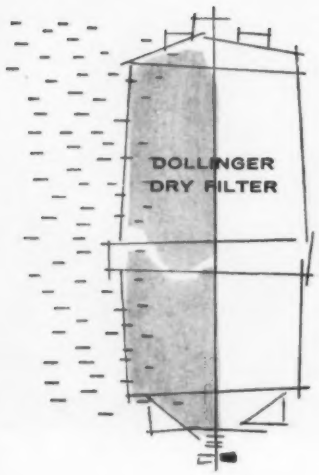
625 Cedar Street, BERKELEY 10, CALIF.

L.A. Branch: 12121 Los Nietos Rd., SANTA FE SPRINGS, CALIF.

5525 S. E. 28th Ave., PORTLAND 2, ORE.

Series 850 . . . another of the standard Powers-American Bodies designed for gas and water line construction and maintenance work.

Custom-made or modified-standard bodies can be furnished to meet individual work requirements . . . at prices to fit your budget.



SPECIALISTS
FOR 39 YEARS

PREVENT CLOGGED GAS LINES IN THE FIELD...

DOLLINGER STAYNEW FILTERS remove particles ranging from dry oxide and sticky oil from natural gas lines to lamp black and moisture in manufactured gas lines. Radial fin insert has the largest possible active filtering area for the space it occupies; this results in high efficiency, low resistance without constant servicing. For inspection and cleaning, interior parts of the filter are easily exposed by merely opening a swing bolt—no pipe connections are "broken." Position of inlet and outlet connections may be varied to suit individual applications. Available capacities from 28,000 SCFH. to 2,000,000 SCFH. Install at district regulator stations, industrial plants, power plants, other large meter and control stations. Write for Gas Filter Bulletin 290-R. Dollinger Corporation, 68 Centre Park, Rochester 3, New York.

IN THE HOME

DOLLINGER STAYNEW FILTERS are the most economical way to remove dirt, pipe scale and other foreign matter from lines in the home. Once installed, this filter stays in place permanently—the line never has to be "broken." Removal of a single bolt completely dismantles the filter for cleaning and inspection. Exclusive radial fin design gives 72 square inches of active filtering area—three times greater than other filters. Staynew Home Gas Filters are designed for 125 p.s.i. pressure, 600 SCFH capacity. All sizes available on request. Write for complete details. Dollinger Corporation, 68 Centre Park, Rochester 3, New York.

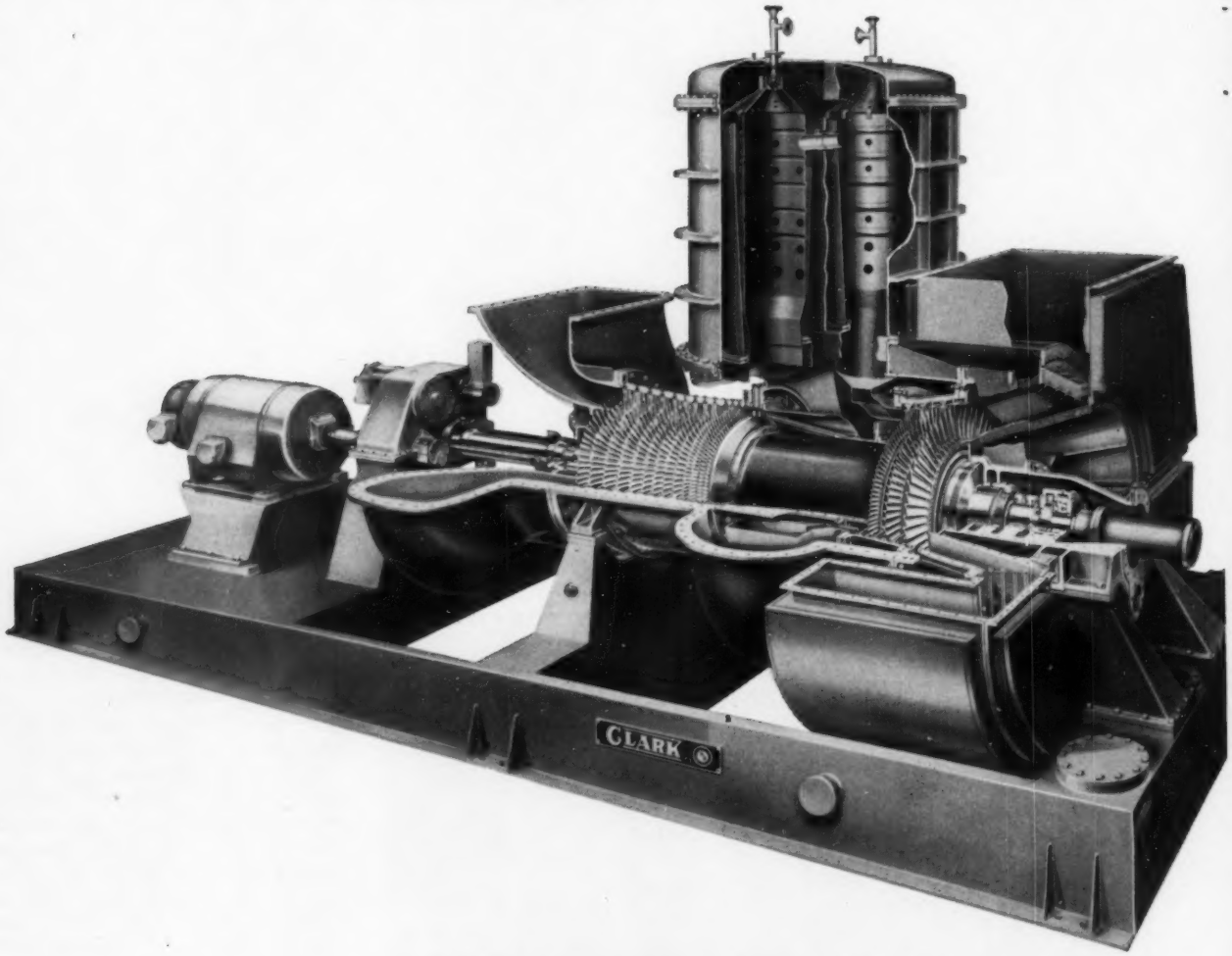
PROTECTOMOTOR

STAYNEW FILTERS

DOLLINGER

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

No matter how you gauge PRIME MOVER COST...



CLARK BROS. CO., OLEAN, N.Y.

CLARK®

DRESSER INDUSTRIES INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

ENGINES • GAS TURBINES • COMPRESSORS

the CLARK 300 series of GAS TURBINES measures up fully to your needs

Name the norm . . . capital investment, floor space, installation or operating labor, general reliability, maintenance or all combined. Whatever you use to determine *real* prime mover cost, Clark heavy duty industrial gas turbines provide the most economical answer to your requirements. As an example of how these advantages work for you let us examine the latest addition to the Clark 300 series of turbines, the Model 305-S.

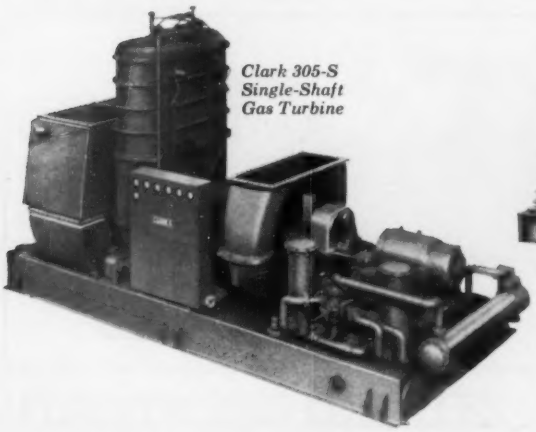
CONSIDER INITIAL INVESTMENT—This single-shaft open cycle machine is simplicity itself. With the axial compressor and three stage turbine mounted on the same shaft, parts . . . *and cost* are cut to a minimum.

FIELD PROVED RELIABILITY—Important components such as compressor and turbine blading are based on proved designs which have operated for thousands of hours in Clark Dual-Shaft Gas Turbines. Turbine inlet temperature is held under 1400° F to ensure extra long life and to provide a substantial margin of operating safety. The turbine is completely air cooled and suitable for operation in arid country. Pressurized air is bled off the axial compressor to cool turbine blade roots and other high temperature components. In addition, cool air envelopes between inner and outer skin surfaces reduce heat loss and minimize heat radiation.

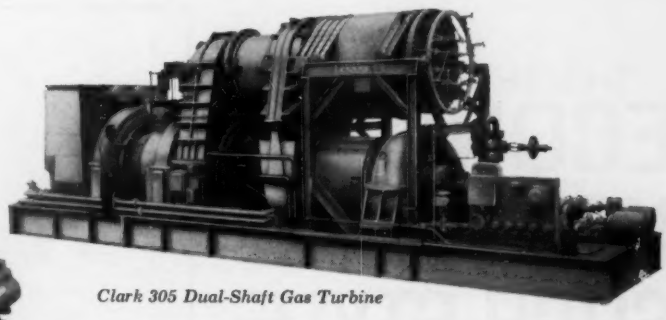
FLOOR SPACE INSTALLATION AND MAINTENANCE—The Clark 305-S is so compact it is mounted on a skid only 26 feet long. The combustion chamber with two parallel burners is placed over the rotor between compressor and turbine. You save on floor space, housing, transportation to the site, foundation and installation expense. Both the single and dual-shaft Clark gas turbine designs have provisions for easy access to blading, bearings and seals for inspection or maintenance.

VERSATILE TOO—Clark Series 300 Gas Turbines in the 8000-10,000 horsepower class provide the inherent flexibility to match the application. The dual-shaft models are excellent drivers for pumps or compressors on liquid or gas transmission lines, for marine propulsion, compressor drivers in repressuring or process plants and other uses requiring broad speed and loading flexibility. For applications that do not require the wide range flexibility of the dual-shaft machine such as base load or peaking turbogenerators the single-shaft units are ideal. Both designs burn either liquid or gaseous fuels.

Your Clark representative will gladly give you all of the cost saving details on Clark Gas Turbines. Consult him or write us direct. CLARK BROS. CO., OLEAN, NEW YORK.



Clark 305-S Single-Shaft Gas Turbine



Clark 305 Dual-Shaft Gas Turbine

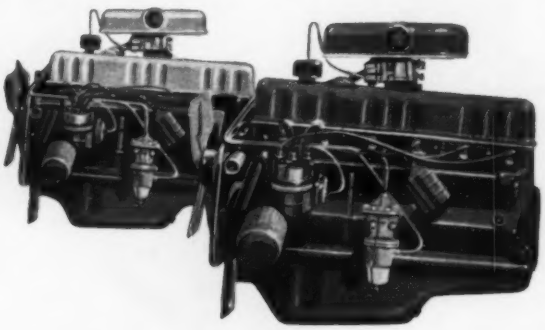
ANNOUNCING THE 1961 FORD FALCON PICKUP

LOW IN PRICE – AMERICA'S LOWEST-PRICED COMPACT PICKUP!

What a Falcon saves you on price* could keep your gas tank filled for thousands of miles! And there's more savings to come! Main underbody members are Zinclad-protected against rust and corrosion. Front fenders bolt on for ease of replacement—cost just $29.95 each. Insurance is as much as 15% less. Aluminized muffler lasts up to three times as long as ordinary types. You save on tires, on brakes, on oil . . . you name it and your Falcon saves it!

*Based on latest available manufacturers' suggested retail delivered prices

ECONOMY NEVER HAD SUCH STYLE



LOW GAS COSTS—OVER 30 MILES PER GALLON IN CERTIFIED TESTS!

In certified tests by the country's foremost independent automotive experts, the Falcon Pickup with 144-cu. in. Six scored as high as 38.3 miles per gallon! Average of all tests combined—hills and traffic, as well as moderate speeds on the level—was 30.5 mpg! Low oil costs, too—change it only every 4000 miles!

- *Roomy comfort for 3 husky passengers!*
- *Rides, handles like a passenger car!*
- *High Falcon fashion inside as well as out!*
- *Optional Fordomatic Drive available!*

1961 Falcon Ranchero, shown here in Montecarlo Red, is available in 8 handsome colors with Color-Keyed Luxury interiors.

NEW HIGH-PERFORMANCE OPTIONAL SIX!

For '61 Ford's new Falcon Ranchero offers a choice of two modern gas-saving engines—144 Economy Six and, as an option, a new high-performance 170 Six. Both available with standard or Fordomatic transmissions. And thanks to the simplicity of their proven design, servicing is fast, low in cost!

LOW LOADING HEIGHT

Cargo floor to the ground measures a scant 25.2 inches . . . that means easy loading. And what a load! The Falcon Ranchero has a full 800-lb. load capacity! In its big six-foot box—over 7½ feet with tailgate flat—there's room to spare for just about any pickup job! You can open or close the tailgate with one hand . . . it locks tight and rattle-free automatically!

See your Ford Dealer's Certified Economy Book . . . it proves

FORD TRUCKS COST LESS

Ten 20-ft. lengths of rigid pipe after being coupled. Two workmen did this job in only 20 minutes!

Workmen joining two sections of 1¼" rigid pipe.

ARIZONA PUBLIC SERVICE COMPANY SAVES 50% WITH RIGID PIPE

made of ABS Plastic

RIGID PIPE GAS SYSTEM INSTALLATION OFFERS NEW PROOF OF SUPERIORITY OVER CONVENTIONAL TYPE

Big news for happy housewives in Gila Bend, Arizona—the convenience of gas utility service for the first time! Important news for utility companies everywhere—the 50% savings over cost of conventional pipe gained by use of Anesite rigid ABS pipe made of CYCOLAC throughout the system! Saved precious man-hours, too! Arizona Public Service Company completed the job in record time . . . insured a failure-free system with this lightweight, leak-proof, AGA-approved pipe. Another example of better service . . . bigger savings from rigid plastic pipe in vital municipal installations!

BE *ABSolutely* SURE . . .
INSIST ON RIGID ABS PIPE
made of
CYCOLAC®
THE BORG-WARNER PLASTIC THAT IS TOUGH, HARD AND CORROSION-RESISTANT

Write for the name of your nearest supplier

MARBON CHEMICAL
WASHINGTON

MARBON CHEMICAL
B-W
BORG-WARNER

DIVISION **BORG-WARNER**
WEST VIRGINIA

UNEQUALLED IN ITS CLASS

RELIANCE SERIES 1200

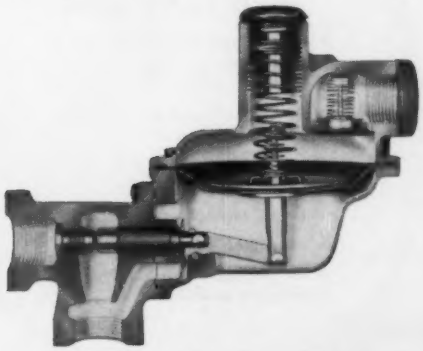
DOMESTIC SERVICE REGULATOR

Developed specifically for house service installations, the economical Series 1200 four-inch diaphragm class regulators provide many *exclusive* quality features with field-proven, dependable performance. Series 1200 Reliance regulators provide the most advanced design for those companies whose systems lend themselves to use of small regulators for compact meter settings.

Capacity of the 1200 Series is 270 cfh at 2 psi inlet, $\frac{5}{16}$-inch orifice and 1-inch w.c. pressure drop, with correspondingly higher capacities for other inlet pressures and orifices. Suitable for inlet pressures to 125 psi and outlet pressures from 5- to 15-inches w.c. Manufactured to conform to A.S.A. Code requirements.

Two models are available . . . standard Model 1203 and *full capacity internal relief* Model 1213B. Both models are also provided as Series 1300 regulators with *detachable* meter bar for 6- or 11¼-inch connection centers.

See Bulletin 105 for complete details and specifications.



CHECK THESE EXCLUSIVE FEATURES!

- RUGGED CAST IRON PIPE SECTION provides maximum strength — prevents thread galling.
- POSITIVE LOCKUP — gives over 20% greater available lockup power than any comparable regulator of its class — provides greater safety factor in event of foreign matter on valve seat.
- REMOVABLE DIAPHRAGM SECTION for ease of servicing without disturbing piping connections — valve seat disc easily replaced.
- TWO-PIECE CONSTRUCTION permits choice of four valve head positions.
- ADJUSTABLE RELIEF VALVE for accurate setting of any desired relief pressure.
- DETACHABLE METER BAR models available for both 6- and 11¼-inch connection centers.

CHECK THESE QUALITY FEATURES!

- Compact design reduces meter set assembly costs — elbow-type cast iron head simplifies piping connections.
- Relief valve stop assures relief valve operation under the most severe conditions.
- Extra-large ¾-inch weatherproof screened vent provided in four basic positions.
- Die-cast aluminum alloy body and top for ease in handling, shipping and setting.
- Brass orifice easily changed through inlet connection.
- 125 psi maximum inlet pressure. Springs available for outlet pressures from 5- to 15-inches w.c. Body sizes ¾- and 1-inch. Orifice sizes ⅛-, ⅜-, ¼-, and ⅜-inches.

AMERICAN METER CO. EST. 1836

AMERICAN METER COMPANY

INCORPORATED (ESTABLISHED 1836)

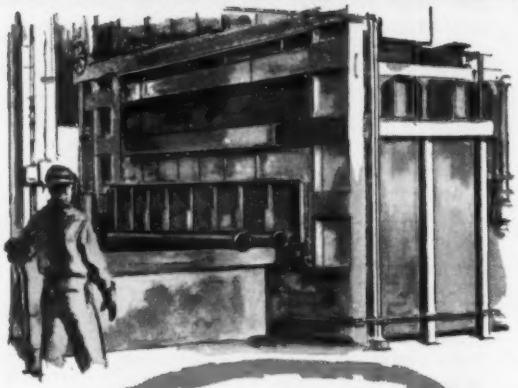
GEM

General Offices: Philadelphia 16, Pa.
Sales Offices in Principal Cities

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

THE BLACKSMITH . . . legendary figure of other days, heated his metals in a crudely built forge.

BASIC...but better than ever today



TODAY . . . dependable gas supplies heat for thermostatically controlled heat treating furnaces such as used for our cast iron pipe.

Cast iron pipe's reputation for long life was won the hard way—by proved performance in the field.

Throughout the country today many cast iron gas mains, a century and more old, are still serving.

This outstanding record is the result of cast iron's inherent quality. Quality that we, for one, maintain at maximum levels by supervising every production step from mine to finished product.

You can depend on U. S. Pipe. It is quality-controlled in manufacture to insure top performance in the main.

SERVICE IS BUILT INTO CAST IRON

- **Standardized mechanical joints are bottle-tight for usual gas distribution pressures . . . and for all types of gas.**
- **Centrifugally cast pipe is tough, strong and uniform.**
- **Joint design allows for deflection during and after installation.**
- **Service connections are easily made.**
- **Long life a matter of record.**
- **No shortages. Cast Iron Pipe is immediately available.**

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

U.S. cast iron PIPE
CAST IRON

GEM

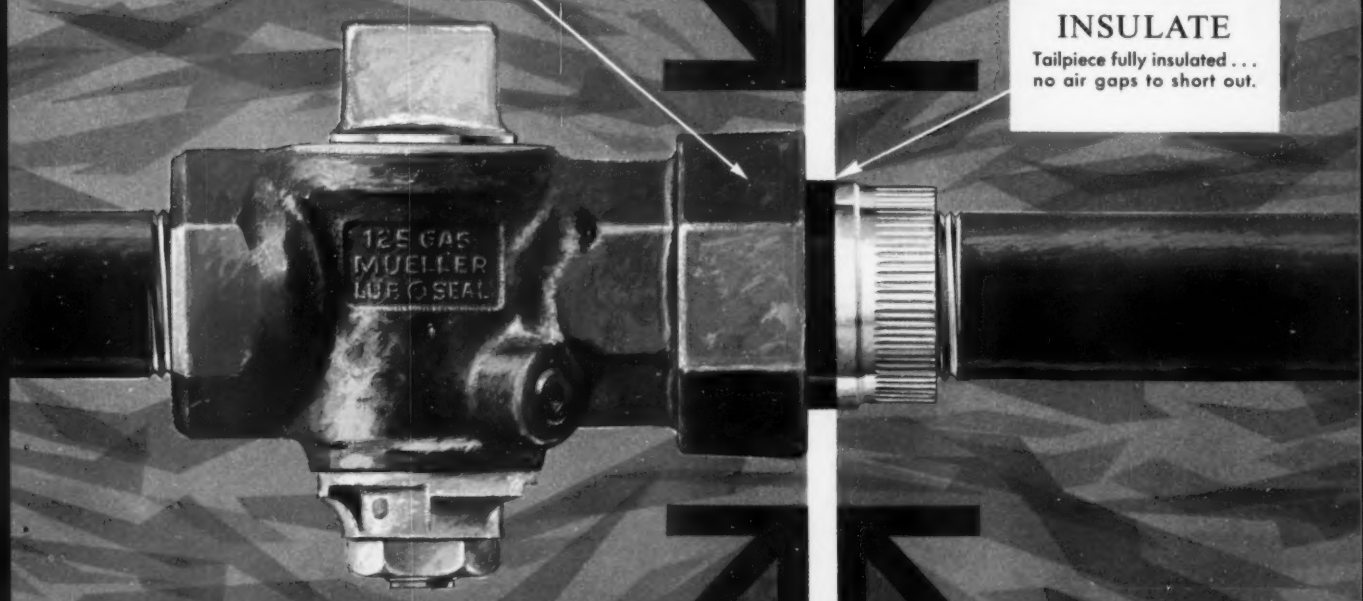
now

AN INSULATING UNION THAT WILL NOT LEAK!... IS FOOLPROOF TO INSTALL

- TIME, WEATHER CONDITIONS, PIPELINE MOVEMENT WILL NOT CREATE LEAKS...
- NO LOOSE GASKETS

SEAL
Retained O-ring maintains positive seal with minimum nut torque.

INSULATE
Tailpiece fully insulated... no air gaps to short out.

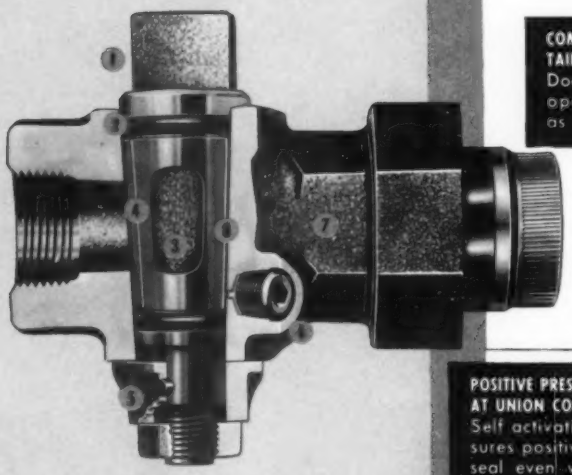


MUELLER CO. DECATUR, ILL.

Install it... forget it!

the new

This maintenance free insulating union is stronger than the piping system. The malleable iron nut completely covers coupling threads after installation. The knurled steel tailpiece is cadmium plated to resist corrosion and lubricate threads.



The service-proven Mueller LubOseal Stop with quality-matched Insulating Union Outlet.

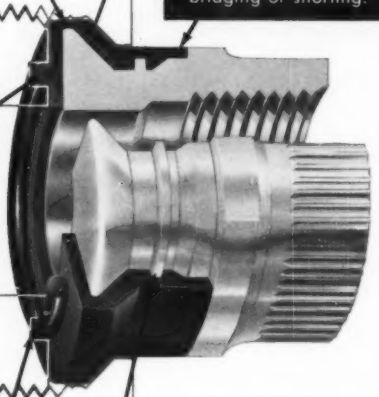
1. Iron Body—Bronze Key
2. Top and Bottom O-ring Seals
3. False Ports in Both Key and Body
4. Lubricant Distribution Grooves
5. Tamper-Proof Construction
6. Simple Re-Lubricating Port
7. Convenient Wrench Flats
8. Entire Seating Surface Lubricated

COMPLETELY INSULATED TAILPIECE
Does not depend upon an open "air gap" to serve as an insulator.

BEVELED CONSTRUCTION
Beveled flange increases bearing surface to provide additional strength. Proper thickness of insulator reduces creep.

EXTRA LONG INSULATOR SKIRT
Extra length prevents bridging or shorting.

POSITIVE PRESSURE SEAL AT UNION CONNECTION
Self activating O-ring assures positive, permanent seal even when coupling nut is only hand tight.



NO LOOSE GASKETS OR WASHERS
Special groove retains O-ring even with nut and tailpiece removed. O-ring cannot flow to obstruct gasway.

POSITIVE SEAL UNDER INSULATOR
GRIPPING ACTION of "Zytel"*105 shown above. This constant pressure provides permanent seal between insulator and tailpiece.

NO FUTURE LEAKS
Combined groove and flange design restricts creep. Minimizes effect of temperature and humidity on insulator and prevents future leaks.

*DuPont Co. registered trademark

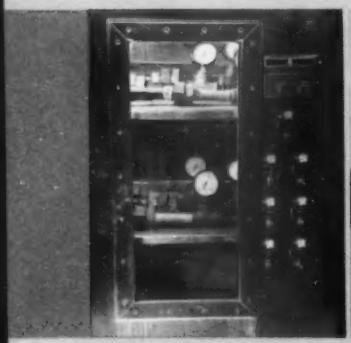
MUELLER® *Insulating Union Stop*

TESTS PROVE SUPERIORITY

Extensive tests duplicating extreme service conditions over long periods of time prove the superiority of this Insulating Union. Throughout its development, Mueller Engineers have subjected this product to a full range of tests. The results of these tests prove its ability to perform under the most severe service conditions over long periods of time. A few of these tests conducted in Mueller's Product Testing and Development Laboratory are shown below.

EFFECTIVE ELECTRICAL INSULATOR
Insulating material is "Zytel" 105, a very effective insulator. It is an inert, stable material which does not absorb moisture to the extent that it impairs its effectiveness as an insulator.

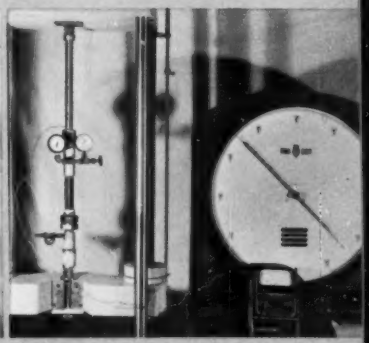
It has high bearing and impact strength and can easily be handled without special precautions.



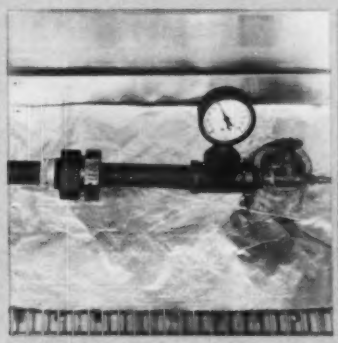
TEMPERATURE-HUMIDITY TESTS
Test No. 1: 150°F. temperature and 90% relative humidity for a period of 160 hours.
Test No. 2: 450°F. temperature for a period of 1 hour.
Test No. 3: —20°F. temperature for 2 hours then +150°F. temperature for 2 hours then back to —20°F. temperature for 2 hours. Continued for 30 complete cycles.
RESULTS—No leaks—at union connection or under the insulator during any of these tests.

NUT OVERTIGHTENING TEST
One end of 1" union rigidly supported. Torque load applied to union nut.
RESULT—Thread failed at a torque of 17,000 in. lbs. No leaks even after failure. No change in electrical resistance even after failure.

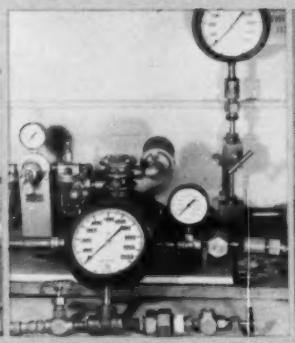
BENDING TEST
One end of union rigidly supported. Load applied to pipe connected to union.
RESULT—Schedule 40 steel pipe broke. No leaks at time of pipe failure. No change in electrical resistance at time of pipe failure.



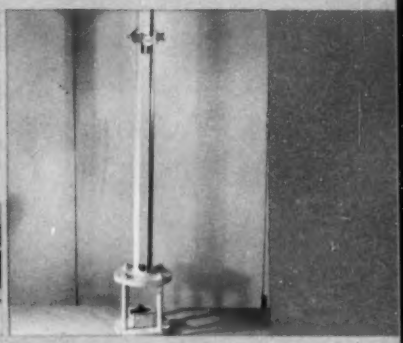
TENSION TEST
Tensile load applied to pipe connected to union.
RESULT—Schedule 40 pipe broke. No leaks at time of pipe failure. No change in electrical resistance at time of pipe failure.



LOW NUT TORQUE TEST
Union nut tightened only HAND TIGHT. 175 p.s.i.g. air pressure with union submerged in water.
RESULT—No leaks—at union connection or under the insulator.



HYDROSTATIC BURST TEST
Extreme pressure applied to ¾" union.
RESULT—No leaks until failure occurred at 8,000 p.s.i.g.



IMPACT TEST
A steel block equal in weight to the weight of the 1¼" tailpiece was dropped from a height of 6' —striking the edge of the insulator with the 1¼" tailpiece set at a 45° angle.
RESULT—Insulator did not crack. Tailpiece did not leak when reassembled and tested.

MUELLER CO., DECATUR, ILL.

CHOOSE FROM 4 POPULAR **MUELLER** METER STOPS

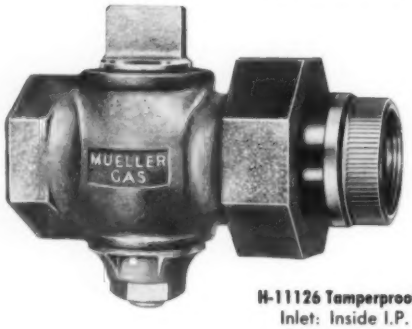
Iron body, bronze key
straight way, solid head
tamper-proof

Insulating Union Outlet

150°F. maximum working temperature
—20°F. minimum working temperature

H-11174 LubOseal Meter Stop
Inlet: Inside I.P. Thread
Outlet: Insulating Union
Finish: Black
Sizes: ¾", 1", 1¼"

H-11179 Lock Wing LubOseal Meter Stop
Inlet: Inside I.P. Thread
Outlet: Insulating Union
Finish: Black
Sizes: ¾", 1", 1¼"



H-11126 Tamperproof Meter Stop
Inlet: Inside I.P. Thread
Outlet: Insulating Union
Finish: Black
Sizes: ¾", 1", 1¼"

H-11128 Lock Wing Tamperproof Meter Stop
Inlet: Inside I.P. Thread
Outlet: Insulating Union
Finish: Black
Sizes: ¾", 1", 1¼"

The many superior features of this new insulating union outlet are a direct result of Mueller's century of experience in developing and manufacturing safer, "matched-design" control products for the gas industry. Write for full information and specifications.

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MUELLER CO.
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Factories at: Decatur, Chattanooga, Los Angeles
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NO PLACE FOR SISSIES

MOTOROLA 2-WAY RADIO TAKES A BEATING... because it's built to take it!

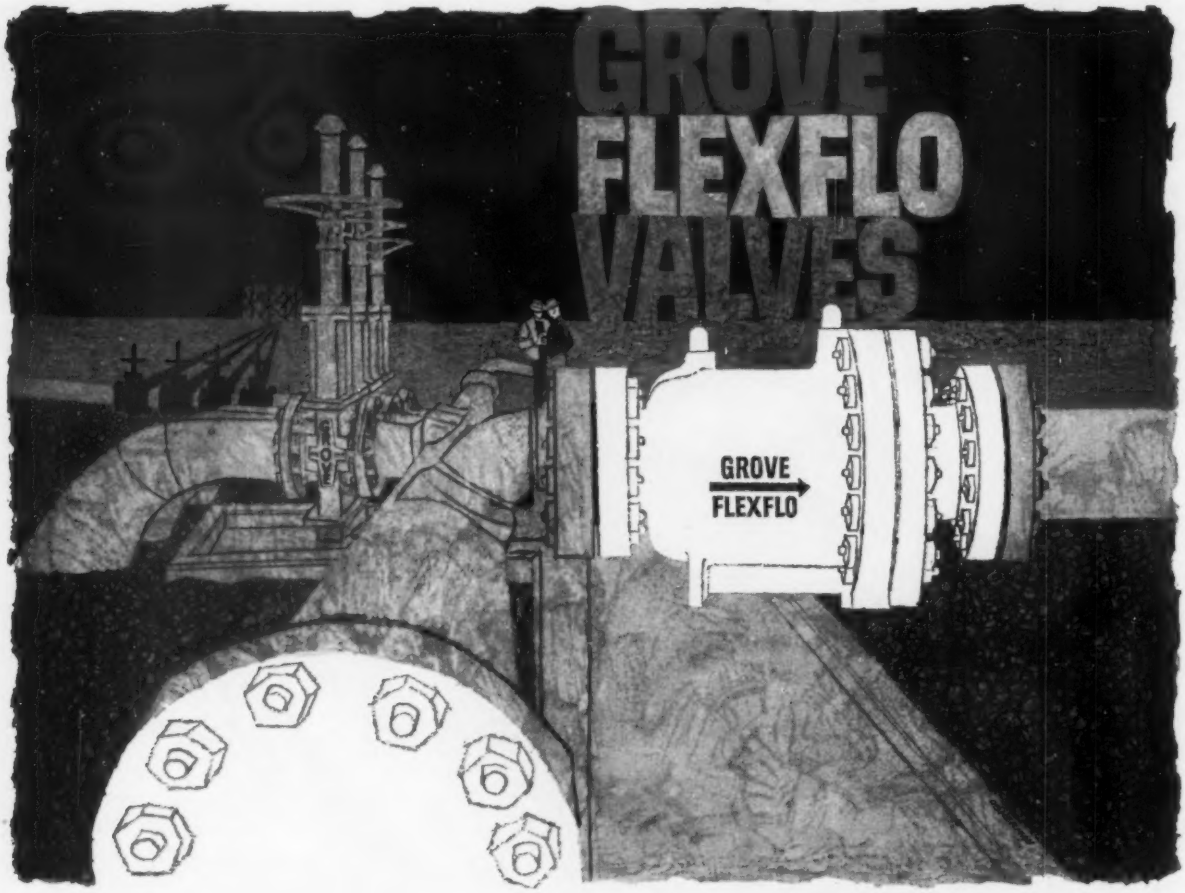
A 2-way radio is a precise, complex electronic instrument. But unless it is *rugged* too—unless it can shrug off jolts and vibration and come back for more—it just can't go to work in the oil fields.

Motorola engineers *design* a radio to take it. Extensive field tests *make sure* it's no sissy—Motorola literally beats the "bugs" out. Then a tough, rigid quality control setup *keeps* them out.

This kind of consistent leadership in research, development and engineering has led to a radio that will stand up to rough treatment and still deliver dependable service—day after day. You'll see *why* when you check with your local Motorola representative—he'll give you all the facts. Write:

MOTOROLA 2-WAY RADIO

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Illinois • A Subsidiary of Motorola Inc.



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DEPENDABLE Assured by unique simplicity of design and construction. Only one moving part, a tough, resilient rubber tube that can never stick or wedge, serves as both diaphragm and valve.

QUIET There is no "slamming". The rubber tube silently rolls on and off the slotted metal body core. Actually, the quietest valve you can use.

VERSATILE Use for pressure reducing, remote control operations, back pressure control, automatic shut-off and manual open-shut flow control. May be self operated or used with electrical, pneumatic or hydraulic actuated pilots. Can handle gas, water, most petroleum products. Available in sizes 1" to 12", working pressures to 1500 psi.

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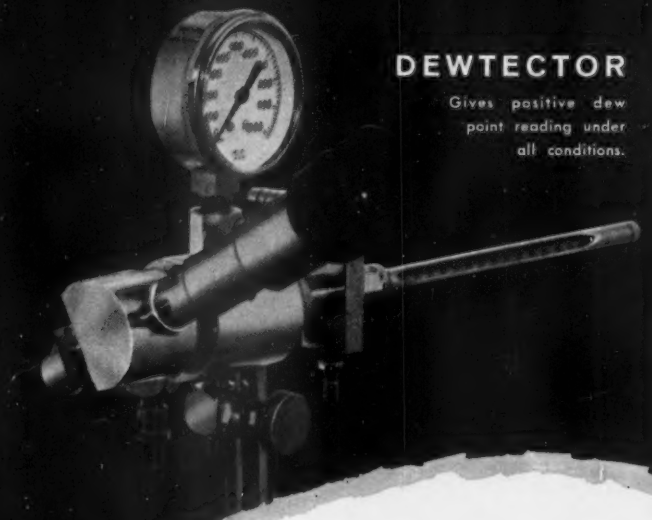

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Gives positive dew point reading under all conditions.

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Continuously averages temperature, gravity or pressure charts automatically.

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United Gas Corporation — the world's largest handler of natural gas — stays ahead in research and instrument development through its newly organized UGC INSTRUMENTS Division. Research has been the key to many UGC operating problems: *safety, dependability, accuracy, economy* and *speed.* Whatever the problems in the utilities industry... gas, electric or water... UGC INSTRUMENTS is solving these problems with instruments that have been developed through research.

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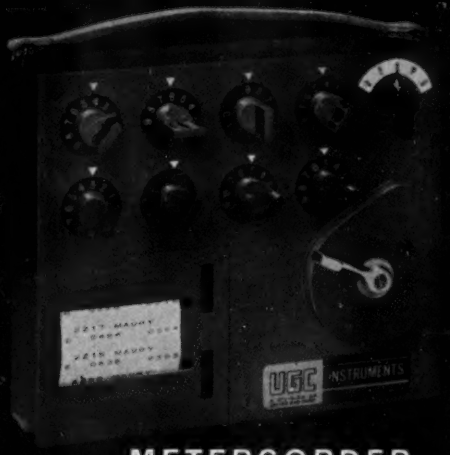

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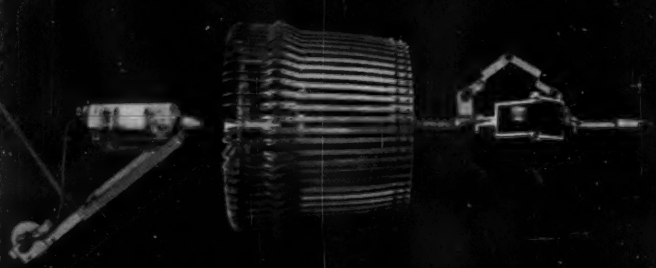
First portable digital tape recorder for meter reading. Completely automatic and weatherproof.



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Locates, measures and records internal pipe corrosion.

VIGILANT

Assures safe, continuous heater operation on pipelines and producing equipment.

See these and other instruments developed by United Gas Corporation at the AGA Convention.

MAXITROL

merges 2 comfort controls

now—one on the wall does it all!

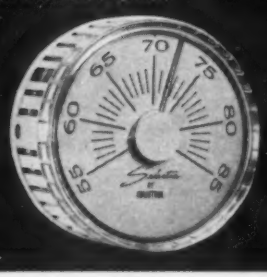
Selectra electronic modulation makes big news again: a thermostat shut-off joins the Selectrastat. In 1959 Maxitrol revolutionized comfort control components by introducing true non-cyclical heat.

Now, the Selectrastat houses the dual control function of modulation and thermostatic shut-off action. Heretofore, the Selectrastat controlled the modulator valve only; a supplementary thermostat was required to control the solenoid shut-off valve. These two functions are precisely calibrated under carefully controlled conditions and bring you added convenience, accuracy and dependability with Selectra electronic modulation. Let us send you the data.

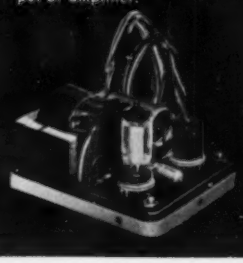
MAXITROL *Selectra*

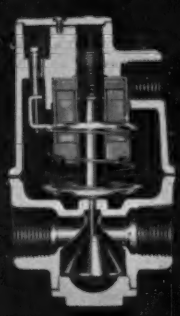
MAXITROL COMPANY • 12200 BEECH ROAD • DETROIT 39, MICHIGAN

Selectrastat sets, senses living area temperature, sends signals to printed circuit electronic amplifier.

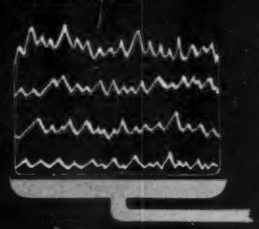


Selectra valve does double duty as a regulator and as a modulator in response to power output of amplifier.





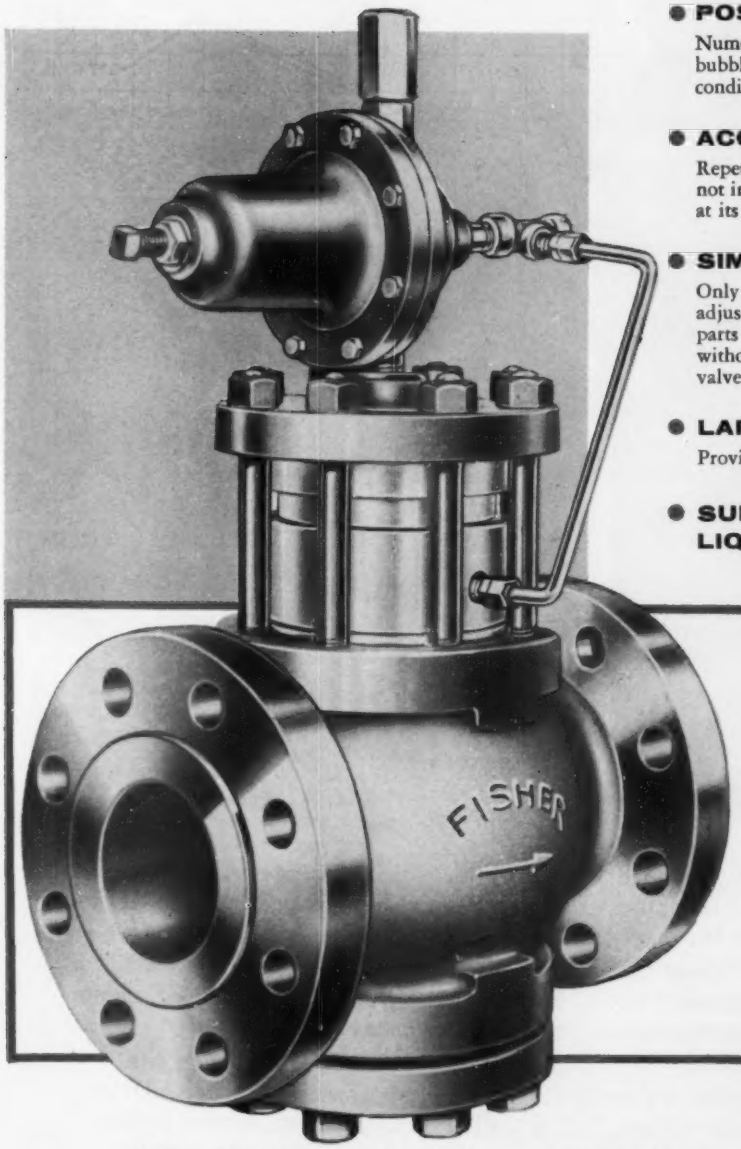
Selectra infinitely modulates flame from full input to ⅓ input. It's not just a "full fire—low fire" system.



For trouble-free service on high pressure lines

NEW FISHER 404

high pressure relief valve



- **POSITIVE SHUT-OFF**
  Numerous field tests show that the 404 gives bubble tight shut-off under all pressure drop conditions.
- **ACCURATE AND DEPENDABLE**
  Repetitive operation, frequent or infrequent, does not interfere with its ability to relieve consistently at its predetermined setting.
- **SIMPLE AND COMPACT**
  Only one moving component in main valve. Only adjustment is pilot spring setting. All internal parts can be removed or inspected in minutes without special tools and without removing the valve body from the line.
- **LARGE CAPACITY**
  Provided by full port body and pilot operation.
- **SUITABLE FOR GAS OR LIQUID RELIEF SERVICE**

SPECIFICATIONS

Body Sizes—2″ Screwed; 2″, 3″, 4″, and 6″ Flanged.

Body Material—Cast Steel.

Valve Disc Material—Composition.

Body Trim—316 Stainless Steel.

Relief Pressure Ranges—30 to 600 psi.

FOR COMPLETE DETAILS WRITE FOR BULLETIN P-404

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S- CONTROLLED BY . . .

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BUTTERFLY VALVE DIVISION: CONTINENTAL EQUIP. CO., CORAOPOLIS, PA.

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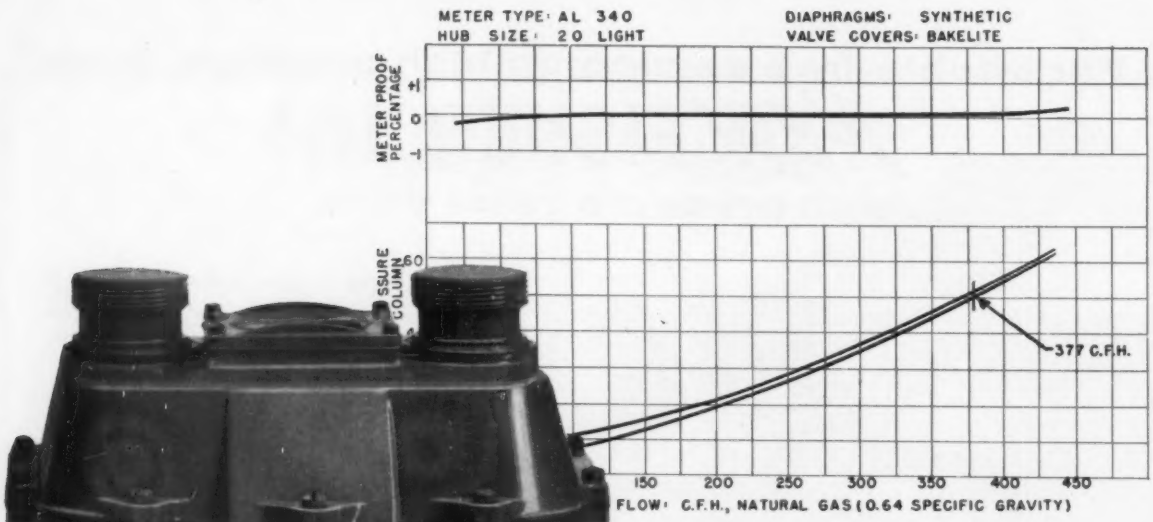

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It's easy to prove the top-notch performance and rugged durability of Superior Aluminum Case Gas Meters on your own test bench.

Look for low differential fluctuation of the water column, and straight-line accuracy on the prover. They are your evidence of smooth performance.

Smooth performance, coupled with Superior's carefully engineered construction, means long-term accuracy. A recent field test has shown no visual evidence of wear in any parts after registration of over 3,500,000 cu. ft....the equivalent of over 20 years in service.

For complete information on Superior's line of Aluminum Case Gas Meters send for Bulletin 1150...or tell us when a Superior representative may call.

P.S. Nationwide sales, service and warehousing facilities are available on all Superior products, to meet utility metering needs. You can specify "Superior" with confidence.

GEM

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for a better / measure of profit

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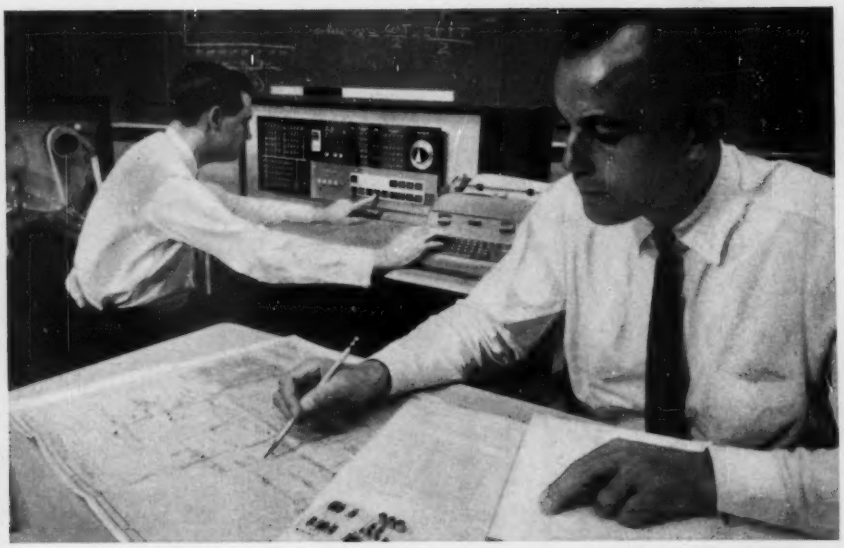
...the most powerful engineering computer in its low price class



In the Gas Industry the IBM 1620 solves problems like these:

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- *pipe line design and simulation*
- *compressor performance analysis*
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The new IBM 1620 is a desk-size engineering computer that offers you more computing ability per dollar than any system in its price class.

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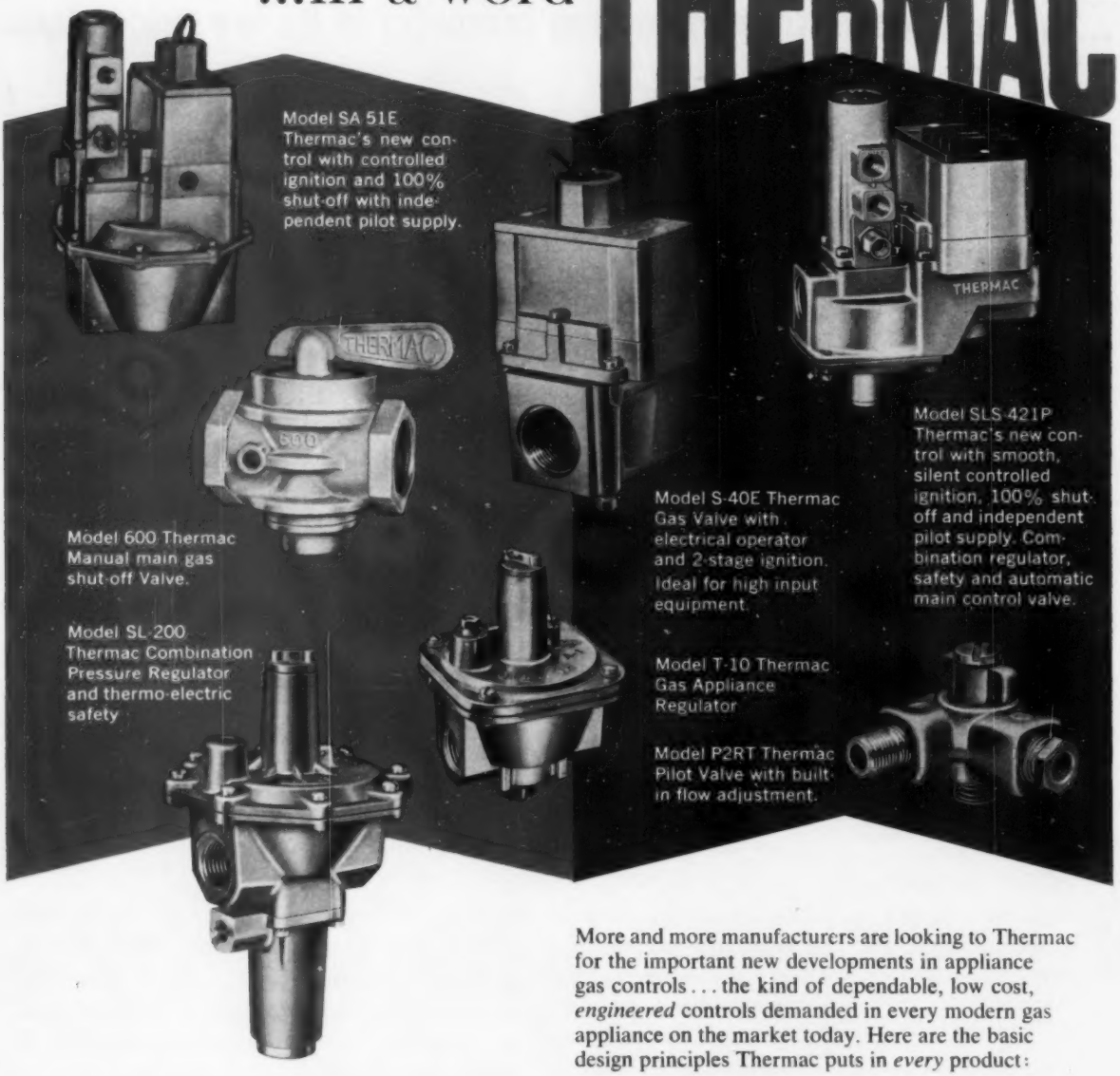
QUALITY LOW COST GAS CONTROL ...in a word THERMAC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Model SLS-421P Thermac's new control with smooth, silent controlled ignition, 100% shut-off and independent pilot supply. Combination regulator, safety and automatic main control valve.
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28 *years' experience building gas controls"*

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ALL CAPITOL FITTINGS give you these benefits

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All CAPITOL Forged Steel Unions, 3000#-6000#, are individually pressure tested... 250# unions with brass seat and 300# unions with integral steel or brass seat are made to the rigid requirements of Underwriters Laboratories. All types of Insulating Unions to eliminate corrosion caused by electrolysis or galvanic action are available in every needed size.

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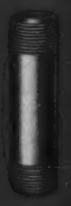
ASK YOUR DISTRIBUTOR FOR CAPITOL FITTINGS

Specify CAPITOL to assure job-tested fittings. Steel fittings assure no sand holes, no porosity. Every CAPITOL fitting equals or exceeds all published specifications for its size and pressure. All are conveniently packaged and protected to ensure delivery in factory finish condition.



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FORGED STEEL ELLS and TEES

2000#, 3000# and 6000# Screwed and Socket Weld. Wider-heavier bands for extra strength at the threads. Packaged in convenient cartons.

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For joining plastic and metal pipe. Double-galvanized. Packaged in convenient cartons.

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Screwed and Socket Weld. Sizes ⅛" through 3"

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Packed in convenient cartons. High Pressure plugs are individually thread protected.

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All sizes. Packaged in convenient cartons.

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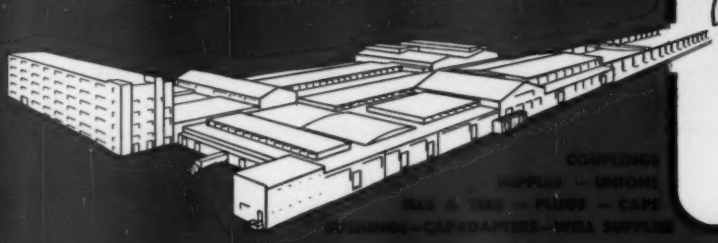
SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS



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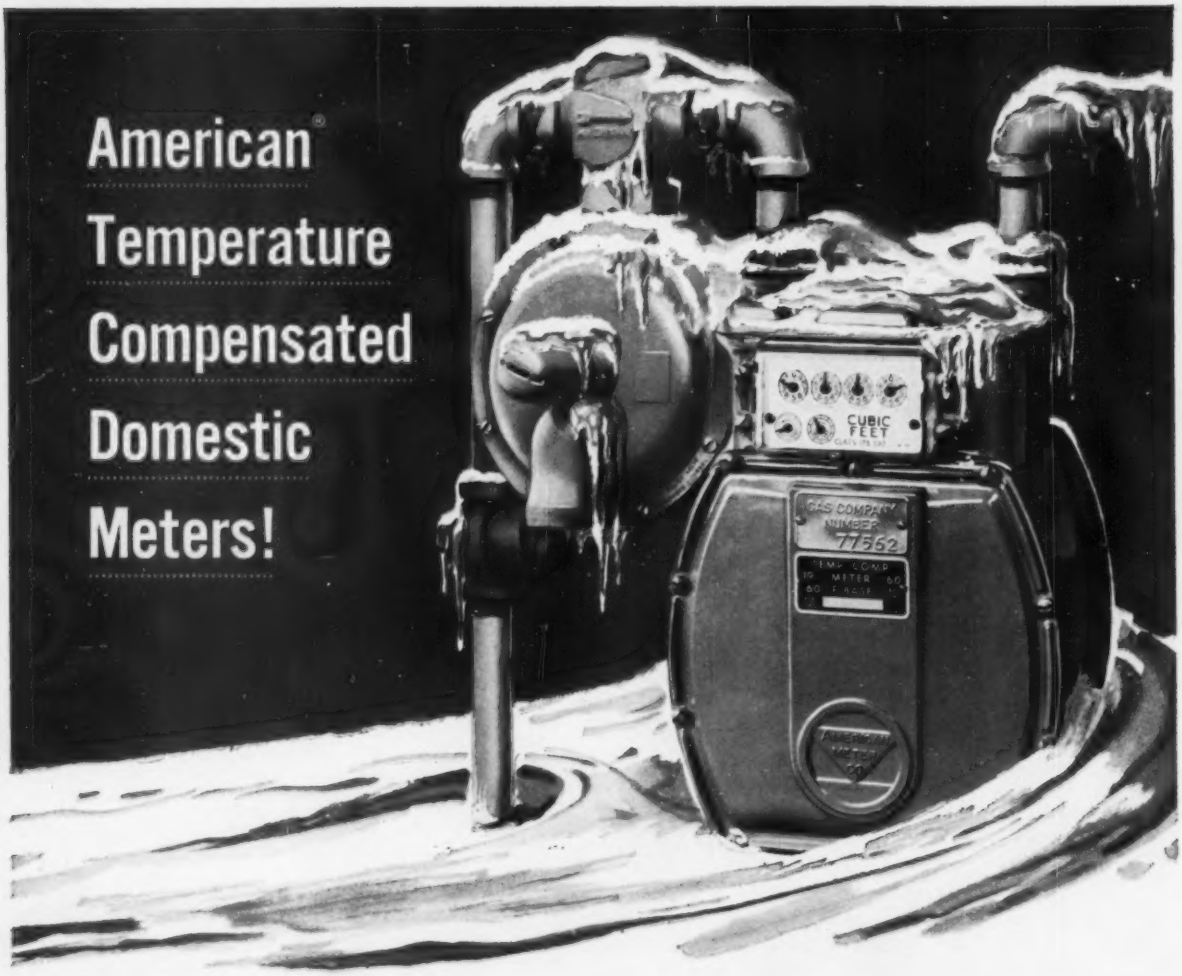
MANUFACTURING CO.

DIVISION OF HARSCO CORP.

COLUMBUS, OHIO

Now, from the pioneers in temperature compensation...



Once again, American Meter Company research has made a tremendous contribution to the technological progress of the entire Gas Industry. Like every other American Meter advance, the Temperature Compensating Domestic Meters are an outgrowth of the Company's continuous search for *better* ways to serve the industry's needs. In fact, nearly 30 years have passed since American Meter introduced the first temperature compensating device for large Positive Displacement Meters—the Base Volume Index.

The new Temperature Compensator is continuing proof that the Gas Industry can count on American to develop the most modern, accurate measurement equipment. American has pioneered in meter progress since 1836—and will continue to bring progress through research!

Write for full information.

AMERICAN® METER COMPANY

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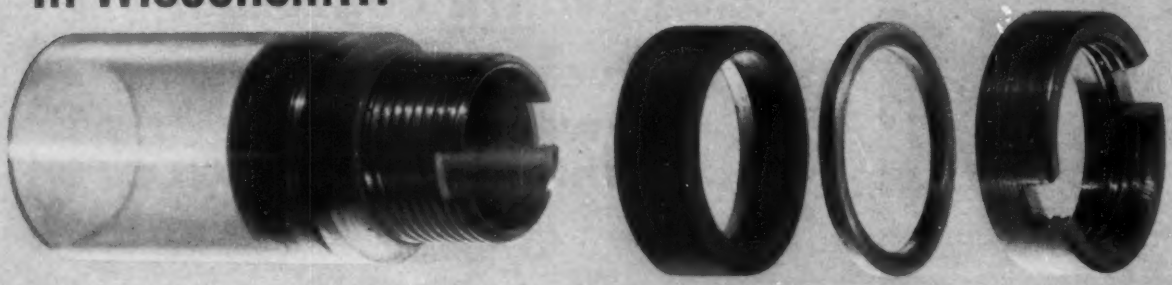
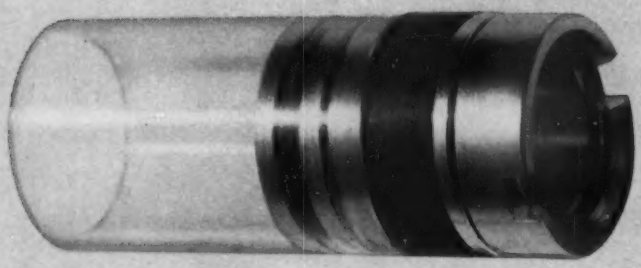


Perfex adapters simplify Butyrate service renewals



Wisconsin Public Service Corporation makes quick, economical plastic-to-metal service head connections with a new leakproof adapter

Wisconsin Public Service Corporation is one of the latest major utilities to adopt plastic tubing of Tenite Butyrate for service renewals. A time-and-money-saving highlight of their installation procedure is the use of a patented service head adapter developed by Perfex Plastics, Inc., of Chicago. With this new adapter, service head fittings are made neatly in existing lines with no repiping or offsetting (see illustration).

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How service head adapter works:

The service head adapter consists of a 3-in. length of transparent tubing sealed to a threaded metal sleeve. Plastic end of adapter is solvent-welded to the Butyrate pipe that has been inserted into the corroded metal service line. Special spanner wrench has lugs that fit into collar on adapter, and is used to force collar against a natural rubber gasket that expands to fit tightly against inside diameter of the old service pipe, making the renewal gastight and leakproof.

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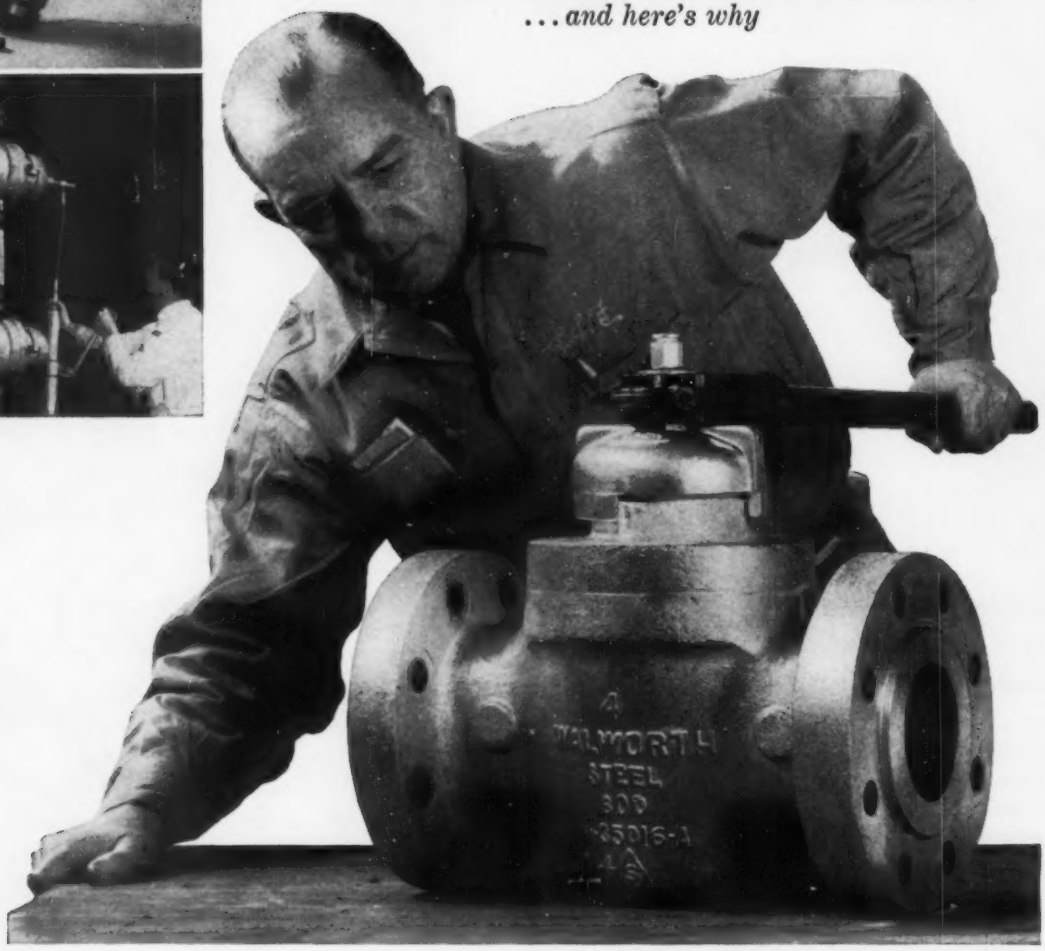

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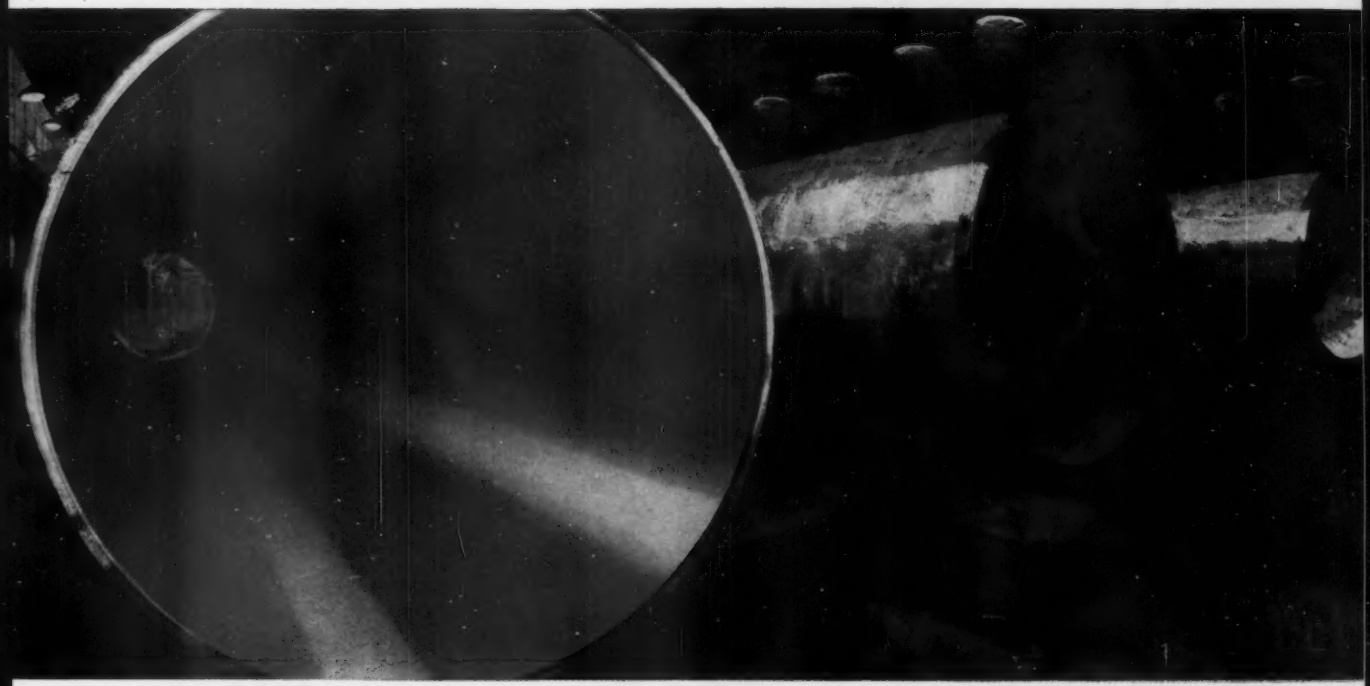

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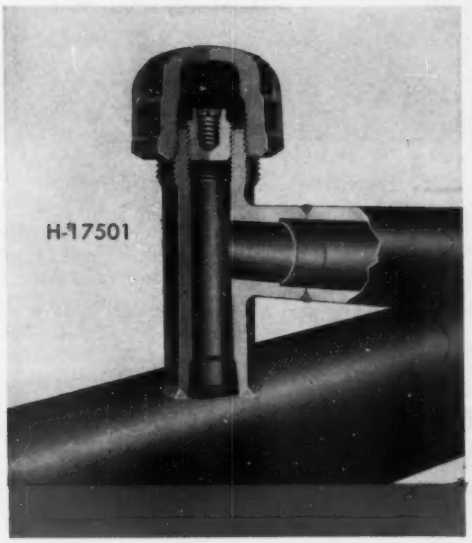

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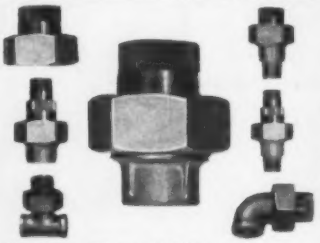

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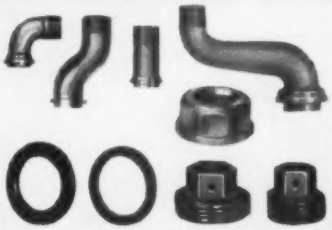

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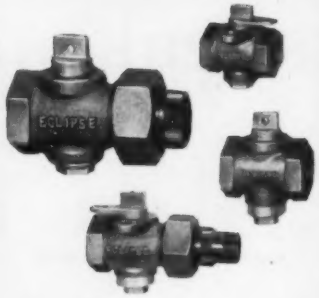

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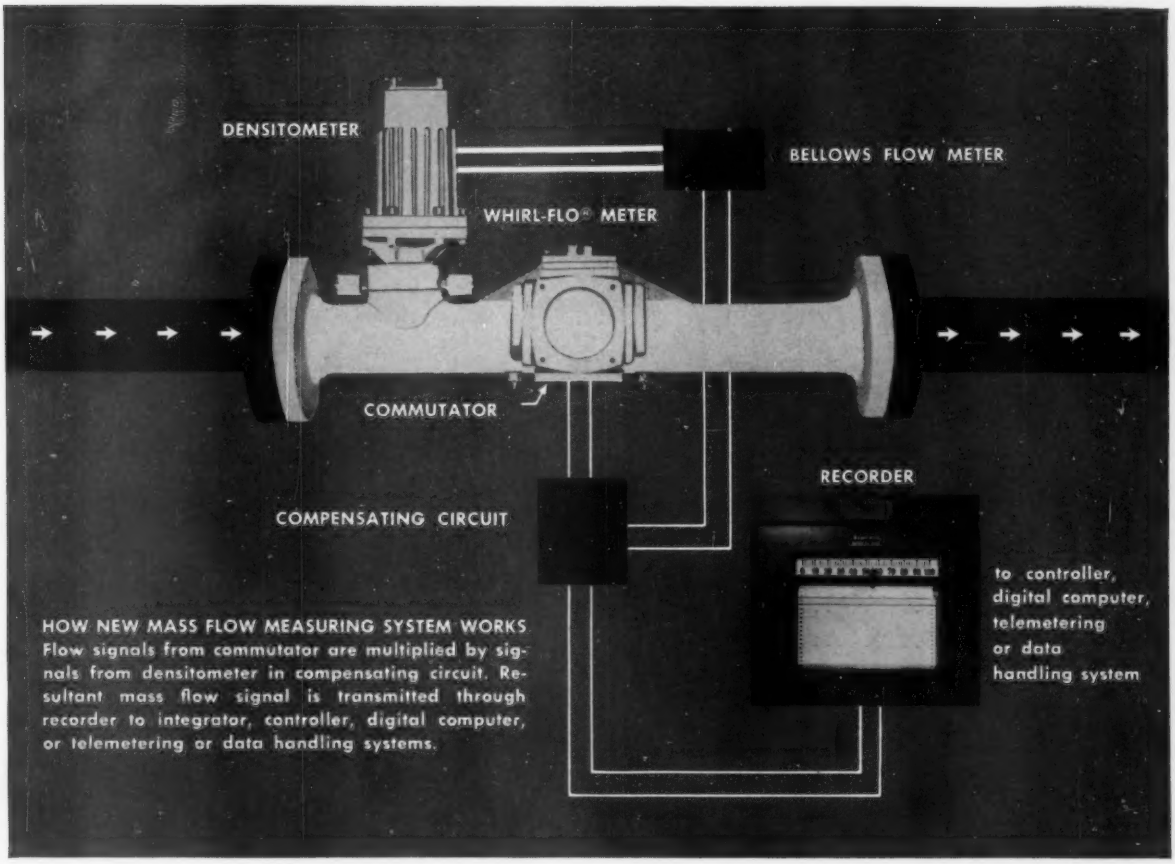
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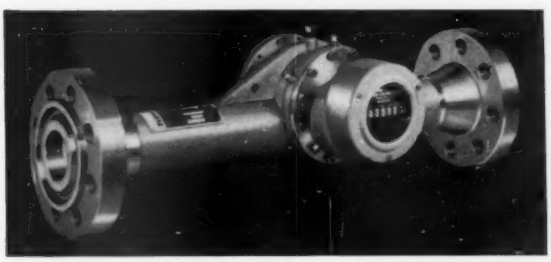

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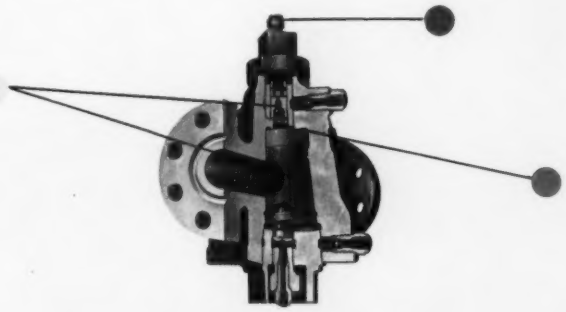

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Carmen Logana, (left) foreman of meter shop, and J. Dugan, superintendent of Gas Measurement, Niagara Mohawk Power Corporation, Syracuse, N.Y.

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GAS

OCTOBER 1960

L. T. POTTER

iceman turned gasman

By WILLIAM T. HARPER, Eastern Editor

"THE Iceman Cometh." And because of it, the gas industry goeth—forward. This iceman is not a figment of Eugene O'Neill's imagination. He is Mr. L. T. Potter, president of the Lone Star Gas Co. and incoming president of the American Gas Association.

"Iceman?" you might question. "How does that figure?" Easily enough. You see, the 41st president of AGA, which represents the country's fifth largest industry in terms of net plant investment, was once exactly that—an iceman. Now if that isn't a paradox . . . Yet, that is the way he worked his way through college.

It started back before 1924, which was when Potter entered Texas A&M. Then, as now, football was a big thing in the Southwest and even ultimate gas company presidents wanted to be gridiron heroes. Also, then as now, it cost money to go through college. Killing two birds with one stone, Potter retained the summer job he had held through high school as an iceman, thereby building himself up physically for football and financially for academics.

Manhandling 300-lb blocks of ice is described by the man as "vigorous." He also thinks of it as "enjoyable and interesting." (Try and tell that to your sons today when they want to use the family car to go to the store two blocks away!) His favorite story regarding that job concerns the "Busy Bee Watermelon Parlor." This outfit was located in downtown Dallas and it sold watermelons (what else) by the truckload. The icebox in this place was actually a huge thing that held 2700 lb of ice. To reach it, it was necessary to climb a rickety ladder. Picture, if you will, the scene of the future president of the AGA carting blocks of ice on his back up that ladder and then jockeying around, while still on the ladder, to slide the blocks into the box. "The man who worked on the truck with me," he recalls, "somehow or another always had something else to do when we made that stop." But, this chore was almost easy. You see, these were "only" 150-lb blocks! Potter says he'll never forget that. Who would?

His visions of being another Red Grange, the "Wheaton Iceman" of Illinois gridiron fame, never did pan out. But, he was even more proud of his selection as a member of the Ross Volunteers, a crack drill team for juniors and seniors only. He was also elected as Captain of that unit in his senior year, "which was somewhat of an honor."

The day after he was graduated from A&M in 1928, Potter went to work for the Lone Star Gas Co., and soon was a helper on one of the company's gas produc-

On civic participation: "I do it because I think a person ought to have interests in such things . . . But I really do it because I'm a representative of Lone Star."

tion wells near Moran, Texas. At that time, Lone Star brought in outside help to do the re-working; that is, it hired a driller, and a tool dresser with their "spudder." Then it supplied the rest of the labor from within the company. In this case, Potter *was* the rest of the labor.

Potter's first boss at Lone Star was James Harold Dunn, presently the president of The Shamrock Oil & Gas Corp. in Amarillo. Dunn knew him well. You see, Dunn was a senior at A&M when Potter was a freshman and a senior there is entitled to have an orderly to keep his room in tip-top, inspection shape. Who was Dunn's orderly? You guessed it. Mr. L. T. Potter, the man of this year in the gas industry. "I can make it plain that his room was kept neat because he and his two roommates were fairly oblivious to the finer points. In the first place, they sometimes weren't even awake while I was cleaning up in there," Potter reveals.

Dunn eventually went on to bigger and better things at Shamrock while Potter did the same at Lone Star. From his first job with Lone Star, Potter climbed up another ladder (this one not so rickety) to assistant production engineer, superintendent of the production engineering department, and then of both it and the production department after they were merged. From there he went on to assistant to the general superintendent of the transmission division, assistant to the then president and now chairman of the board at Lone Star, D. A. Hulcy. In 1954, Potter became executive vice president and on July 10, 1957, he was elected president.

That brings his career story up to date. It might be fitting at this point to list by chapter and verse all of his many industrial accomplishments; to tell how Lone Star's distribution and transmission lines have grown from just over 1000 total miles to slightly less than 20,000 miles since Potter has been with the company and to describe his role in this growth. But there is neither the time nor the inclination to do that here. We'd much rather tell you about the man himself.

In telling about Les Potter, it's interesting to talk with two groups of people; those who know him and those who don't. You can get a real bargain that way —two stories for the price of one. To those who don't know the man, he appears to be the personification of the stern, austere, aloof, highly successful businessman. He ought to shoot the photographer who took that picture the AGA has been using for the past couple of years. In the picture he looks like a cross between Eric Von Stroheim and Nikita Khrushchev. To some others, it makes him look like the late Cecil B. DeMille.

Yet, imagine any of those tyrant-like types telling a story such as the following on themselves: It concerns, appropriately enough, a photographer. As can be seen from the pictures of Potter, he doesn't have an abundance of hair. Still, he talks about a cameraman who calls Potter his only subject "with a built-in reflector." Yes, a picture may be worth 10,000 words but in this case they're all the wrong ones. In person he looks more like a combination of an old-soldier type — such as Dwight Eisenhower — and the late Edmund Gwynn playing his elfish Santa Claus role in the picture, "Miracle on 34th Street."

Actually, he'd make a good Santa Claus. The Potters themselves have no children of their own. But, their home is continually filled with youngsters, be they some of their numerous nieces and nephews or those from around their home in suburban Dallas. Like so many childless couples, the Potters do have a greater appreciation than the mythical Old Woman Who Lived in a Shoe of the wonderful world of kids. For instance, Potter likes to tell this little tale of one of his nephews:

Mr. and Mrs. Potter—a long way from Dallas—decide what show to see on a recent New York visit.

It seems that the seven-year-old youngster came circulating through Potter's library, not noticing his uncle who was sitting there alone. "He was going somewhere," Potter recalls, "I don't know where. He didn't slow up nor look to the right or the left. When he passed my chair, I casually asked him, 'Well, what do you say?' He still didn't slow up as he answered, 'I haven't even figured out yet what I'm supposed to say.' Now you roll that over for a little while and you'll probably decide, as I did, that sometimes these youngsters are a little smarter than most adults." Who can argue that he might be wrong?

There's another story about Potter and children that this writer has tried to resist telling because it has been told several times already. Yet, it so typically illustrates the personality of the man that it bears repeating. Mrs. Potter tells this one. One day she answered a knock on the door to find one of the neighborhood children standing there. The child looked up and asked, in all seriousness, "Mrs. Potter, can Mr. Potter come out to play?" It's a safe bet that he could.

Basically speaking, L. T. Potter is a very uncomplicated man. Pomp and circumstance have no place in his life. He is the president of a company that had almost a half a billion dollars in total assets as of Dec. 31, 1959. Yet, take a walk with him through Lone Star's headquarters and listen to how many people call him by his surname. ("That's a carryover from my days at A&M," he modestly states. "Everyone there is called by his surname.")

Philosophy is where you find it. Some get it from Aristotle and Plato. Others turn to the writings of Descartes or Rousseau and Voltaire. Still others read the words of Bertrand Russell and John Dewey. Les Potter finds that "there's more philosophy on a newspaper's comic page than there is on the editorial page." He reads them all as they appear in the Dallas newspapers. "For a long time, Pogo was my favorite and I'm not going to disclaim him yet," he says. "Peanuts is pretty high on the list right now. People express amazement that a mature person would read all the comics, but actually, I feel sorry for those who don't. For instance, I notice some people overlook the philosophy in Li'l Abner." Anybody want to argue with him yet?

He does occasionally turn to heavier things. He spends many of his leisure hours reading in his library. A long time favorite of his is Van Loon, whose "Story of the Bible" he has read and used many times. The same author's volume entitled "Lives" is also among Potter's favorites. O. Henry is still another. "I've read and re-read even to this day a great deal of his work," Potter relates. For more contemporary reading he "skims" through *Forbes* and *U. S. News & World Report.* He reads *The Saturday Evening Post* "a little bit" and takes in "the jokes" in the *Readers' Digest.* He "thumbs through" the AGA *Monthly.* (Ed. Note: No doubt, he reads *GAS Magazine* cover-to-cover but he merely neglected to mention it.)

One of his big interests in reading is works dealing with the American Civil War (or, The War Between the States, for those of you who still believe in saving your Confederate money in the belief that the South'll rise again!) He has read all four volumes of Douglass Southall Freeman's, "R. E. Lee" and the same author's three-volume work, "Lee's Lieutenants." "I've also read Carl Sandburg's, 'Lincoln' and refer to it a good deal," he mentions. From such writings it is apparent that much of his own personality has been developed.

His interest in history runs beyond the Civil War. He can—if he has to—outline the tactics and the strategy used by the Allies at El Alamein during the

"Official" photo of L. T. Potter

Second World War. "But," he recalls with charming candor, "the only book of historical nature that I ever laid aside was Gibbon's, 'The History of the Decline and Fall of the Roman Empire.' I never got through it. It was too ponderous for me."

When he is not reading at home, he likes to cook—especially outdoors. He terms himself "an oyster stew man" (ask him for his recipe) and his favorite foods are mustard greens, corn bread and black-eyed peas. Don't get him wrong though, he cautions quickly. "I like a steak (about two inches thick and medium rare) as well as anybody. But we frequently have meals at home without meat. I'm not a vegetarian and it's not a matter of having any funny conception about diets. It's just that we like that sort of thing."

Another of the sort of things he does like are the movies, TV and the theater. Again, it's the simple things. Mr. and Mrs. Potter sat through Walt Disney's, "Pollyanna" twice. His television fare consists of watching, "Maverick, Gunsmoke, Lawman, Sugarfoot—any of those that I can catch on to. I go for westerns." At the theater, the Potters prefer the musicals to the dramas. During one recent trip to New York City, they saw both "Fiorello!" and Jackie Gleason in, "Take Me Along."

One of the things he does not like is smoking. He gave that up a long time ago. "But don't let that stop you. Light up, if you want to. I still like to smell a cigarette or a good cigar," he says, almost wistfully. In giving up smoking, he used the Alcoholics Anonymous technique. He kept a pack of cigarettes always nearby, knowing that if he wanted one, it would be there. It worked.

Speaking of the AA, he is not a teetotaler. Currently, he is a gin-and-tonic man and he used to be a cooking whiskey and creek-water fancier. "We don't have a cocktail every evening or anything like that," he cautions. "But, we do when friends are in to visit us." One drink before dinner is plenty for him.

Potter used to be a golf "bug" but he gave that up when he found out it was too difficult to sneak his clubs into his lunch pail during his early days out in the field with Lone Star. Fishing in his primary get-away-from-it-all activity these days. "I'm a fly-rod man by preference," he says. "The best fishing, from the standpoint of a thrill, is fishing for large-mouth bass with a fly rod and a popping bug, a surface lure." For the past 12 years, the Potters have been taking an annual trip to New Mexico to their favorite relaxing spot.

Another trip Potter likes to take is into the area of the headwaters of the Pecos river. This is the only time he "gets up on his high horse." He goes on a pack trip on horseback to a point that is about 15 miles from any place accessible by automobile. He describes it as "quite isolated but very pretty with fine fishing, though rugged. A pack trip is an experience that everyone should have."

From pack trips to Sunday School teaching illustrates the wide range of the man's interests. He teaches an adult couples' class in the Sunday School Department of Dallas' Kessler Park Methodist Church. He's been doing this as a "substitute" teacher for the past 12 years. Potter is also serving his second term as president of the Dallas Chamber of Commerce. Other civic activities in which he is involved include the Boy Scouts of America, Dallas County Community Chest, American Red Cross, *ad infinitim*. His reasons for such an abundance of community interests? "It's double-barrelled," he points out. "I do it because I think a person ought to have interests in such things as a person. But, I really do it because I'm a representative of Lone Star."

Like so many successful men, he has the ability to remember names of people he has met regardless of how brief the encounter or how far into the past it goes. Telling stories of, for instance, his days at A&M, he brings forth names without the slightest hesitation.

You talk to this man (and it is a pleasure to listen to him as even his off-the-cuff conversation rolls with just exactly the proper words and descriptions) and try to sum up what has been the key to his success. Can it be all of these briefly noted anecdotes and items mentioned above? It is, in part. What about the people in his life and their role in shaping his destiny? Mrs. Potter gets first call here. After that, he says:

"I don't think I'd single out any individual. I would lump people together generally. I realize that my answer is quite general. You expect me to say that Mr. So-and-so gave me inspiration. There was that. I'm quite conscious that there have been a few people that have affected me that way. But, I really can't particularize. Even with Mr. Hulcy, as much as I have learned, profited and enjoyed in connection with him, as much as I admire him, I would still think in terms of this other thing—vague though it is—as the leading proposition."

All this and more go into the makeup of L. T. Potter, incoming president of the American Gas Association. Humble and at the same time proud; a man of complex interests and simple solutions; a man who can talk with the highest captain of industry as well as the lowest private of misfortune is this fourth president of the Lone Star Gas Co. When he says, "You know, if I ever get fired from Lone Star, I can always go back to being an iceman," he says it with deep sincerity. ■

Other new AGA officers

1st Vice President

EDWARD H. SMOKER
President, United Gas Improvement Co., Philadelphia

2nd Vice President

JOHN E. HEYKE
President, Brooklyn (N.Y.) Union Gas Co.

Treasurer

CHARLES H. MANN
Treasurer, Columbia Gas System Inc., New York

Festival of Flame . . . and Talent

ATLANTIC CITY'S newly transformed Convention Hall and Auditorium will house the gas industry's Festival of Flame and idea exchange for four days, starting Sunday, Oct. 9.

AGA's operating section has gathered the new systems, tools, and special techniques developed since late 1958. Gas companies will reveal new methods they have created and put into action. New Freedom Gas Kitchens will flank the giant 90,000-sq ft hall. Gas research men will pursue their laboratory projects.

Not only is the convention a Festival of Flame. It's also a festival of talent, with distinguished speakers from in and out of the industry.

General sessions will carry the theme "Opportunities for: greater understanding, greater sales, and better management."

Speakers at the first general session on Monday morning will be AGA president Wister H. Ligon, former FPC commissioner William R. Connole, and Leo Cherne, executive director of the Research Institute of America.

Tuesday's session will feature Wendell C. Davis, president of GAMA and Cribben & Sexton Co.; Martin L. Bartling Jr., president of the National Association of Home Builders; and Lt. Gen. James M. Gavin (U.S.A. Ret.), now president of Arthur D. Little Inc.

A new type of panel discussion will highlight the Wednesday session. Participating in the "Opportunities Unlimited" panel will be Arnold K. Henry, professor, transportation and public utilities at the University of Pennsylvania; Donald S. Bittinger, president of Washington Gas Light Co.; W. M. Elmer, president of Texas Gas Transmission Corp.; G. J. Tankersley, president of Western Kentucky Gas Co.; and Charles H. Whitmore, president of Iowa-Illinois Gas & Electric Co.

Robert W. Sarnoff, chairman of the board of National Broadcasting Co. is slated to address the Festival of Flame luncheon on the last day of the convention. He will report on what lies ahead for consumer oriented business in the competitive '60s.

Michigan Consolidated Gas Co.'s celebrated, national award-winning Gasarama will have two showings. The Commercial & Industrial and Residential Gas

Bjork

Borger

Derrick

Elmer

Hamilton

Harvey

Johnston

Jones

Ligon

Manz

McGraw

Mullin

Otto

Person

Ritzenthaler

Sturkey

Wadsworth

sections are sponsoring the first showing on Monday afternoon. The Operating section will sponsor Tuesday afternoon's show.

The annual Home Service Breakfast on Tuesday morning will feature Mrs. Annadora V. Shirk, assistant professor of English at Albright College in Reading, Pa.

Section meetings will get under way Monday. Accounting will hold meetings on Monday and Tuesday afternoons. A joint sales session of the Industrial & Commercial and Residential Gas sections is scheduled for Monday afternoon. The Operating section's meeting and the Home Service Round Table also are on Monday afternoon's line-up.

Directors

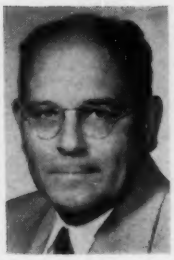
Eskil I. Bjork,* chairman, Peoples Gas Light & Coke Co., Chicago; **H. Donald Borger,*** president, Peoples Natural Gas Co., Pittsburgh; **H. Reid Derrick,** president, Laclede Gas Co., St. Louis; **W. M. Elmer,** president, Texas Gas Transmission Corp., Owensboro, Ky.; **William G. Hamilton, Jr.,*** president, American Meter Co., Philadelphia; **William J. Harvey,*** vice president in charge of gas operations, Public Service Electric & Gas Co., Newark; **Andrew W. Johnston,*** vice president in charge of gas operations, Boston (Mass.) Gas Co.; **Roy E. Jones,** president and general manager, North Shore Gas Co., Waukegan, Ill.; **Wister H. Ligon,** president, Nashville (Tenn.) Gas Co. (outgoing AGA president); **Otto W. Manz Jr.,** executive vice president, Consolidated Edison Co. of New York; **E. Clyde McGraw,*** president, Transcontinental Gas Pipe Line Corp., Houston; **Gerald T. Mullin,**** president, Minneapolis (Minn.) Gas Co.; **Dale B. Otto,** president, New Jersey Natural Gas Co., Asbury Park, N. J.; **R. T. Person,** president, Public Service Co. of Colorado, Denver; **A. B. Ritzenthaler,** vice president for sales, Tappan Stove Co., Mansfield, Ohio; **Charles M. Sturkey,** executive consultant, Washington Natural Gas Co., Seattle; **Guy W. Wadsworth Jr.,** president and general manager, Southern Counties Gas Co., Los Angeles.

* Renominated for two-year term.
** Nominated for one-year term to complete unexpired term of John Heyke, nominee for 2nd vice president.

section chairmen

Accounting: chairman, **R. H. Johnson,** Brooklyn (N. Y.) Union Gas Co.; vice chairman, **Conrad F. Mills,** Philadelphia (Pa.) Electric Co. **General Management:** chairman, **Gordon C. Griswold,** Brooklyn Union; vice chairman, **William B. Tippy,** Commonwealth Services, New York. **Industrial & Commercial Gas:** chairman, **L. J. Fretwell,** Oklahoma Natural Gas Co., Tulsa; vice chairman, **Wilmer D. Relyea,** Public Service Electric & Gas Co., Newark. **Operating:** chairman, **H. L. Fruechtenicht,** Consumers Power Co., Jackson, Mich.; 1st vice chairman, **Edwin F. Trunk,** Laclede Gas Co., St. Louis; 2nd vice chairman, **Albert B. Lauderbaugh,** Manufacturers Light & Heat Co., Pittsburgh. **Residential Gas:** chairman, **John J. McKearin,** Laclede; vice chairman, **Frank J. McLaughlin,** Providence (R. I.) Gas Co.

Johnson



Mills

Griswold

Tippy

Fretwell

Relyea

Fruechtenicht

Trunk

Lauderbaugh

McKearin

McLaughlin

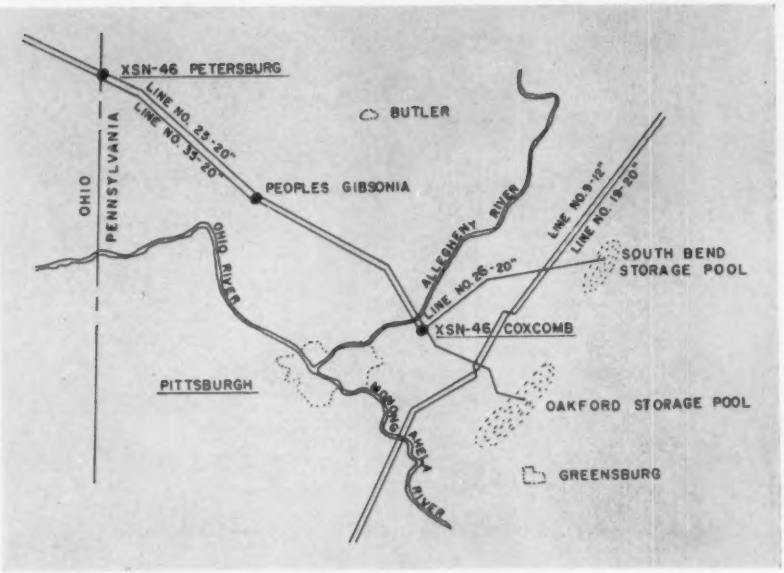
Monday evening attention will be focused on the President's Reception. The Ladies Luncheon is scheduled for Tuesday afternoon. And, a "surprise package" for the ladies is being sponsored by the AGA Home service committee on Monday. Features will be a "Kaffee Klatsch" plus a Gold Star cooking spectacular plus door prizes.

A brand new convention service will be closed-circuit TV, courtesy of the AGA Blue Star home program and Gold Star gas range program. Delegates whose rooms are equipped with TV sets merely tune in to Channel 2 to receive morning and evening broadcasts of world and convention news.

This year's general convention committee is chairmanned by Marvin Chandler of Northern Illinois Gas Co. Christy Payne Jr. of Consolidated Natural Gas System is chairman of the exhibit planning committee. And, Hugh L. Wathen of South Jersey Gas Co. is chairman of the entertainment committee. ■

Again this year, GAS Magazine will publish the "A.G.A. Convention Daily News" from our City Room in Convention Hall. In addition, GAS will present the morning, noon, and evening newscasts over AGA's TV network.

GAS exclusive



Automation gives better control of measuring stations

AUTOMATION of transmission lines and measuring stations has been brought about by the greater flexibility, control and efficiency required to keep pace within the gas industry. In an effort to improve its system, New York State Natural Gas Corp. installed an analog telemetering system equipped with automatic and supervisory control.

Two measuring stations have been automated within the New York Natural system. One is the Petersburg (Ohio) measuring station, about 70 miles northwest of Pittsburgh. The other, the Coxcomb measuring station, is about 30 miles northeast of Pittsburgh, near New Kensington, Pa. Their geographical location with respect to surrounding communities and our storage pools is shown in *Fig. 1*.

New York Natural's dispatcher receives flow, pressure and temperature of gas once every hour from the pressuremen on duty at Coxcomb and Petersburg. This information, along with data received from the rest of the New York Natural system, is recorded on a log sheet. Such data are reported periodically to the Consolidated dispatcher at Clarksburg, W. Va. Flow changes at Coxcomb are requested by the Peoples Natural Gas Co.'s dispatcher at Wilkinsburg, Pa. Changes at Petersburg are requested in Cleveland by the East Ohio Gas Co.'s dispatcher.

By DEAN T. CASADAY
Engineering Department
New York State Natural Gas Corp., Pittsburgh

Fig. 1 (above). Petersburg and Coxcomb measuring stations are shown in relation to surrounding communities and company storage pools.

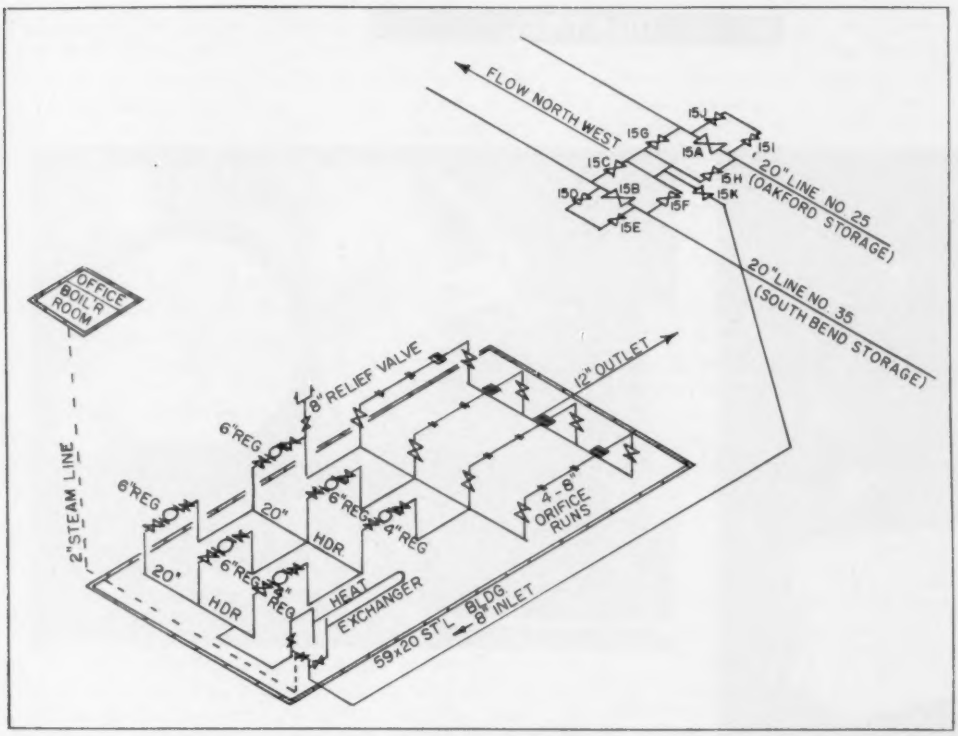


Fig. 2. Coxcomb measuring station.

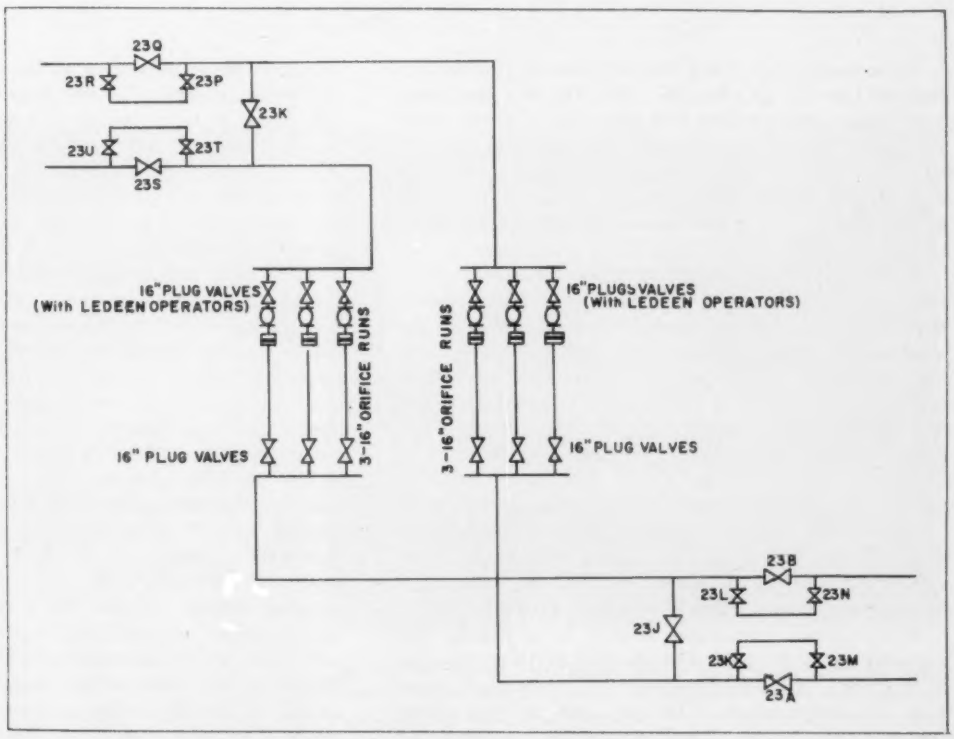
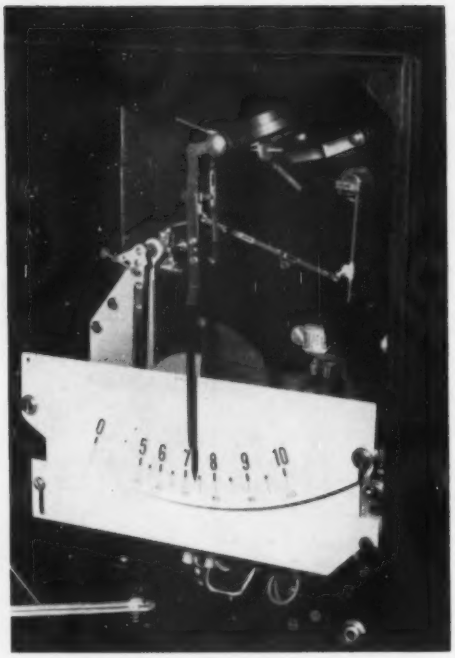


Fig. 3. Petersburg measuring station.



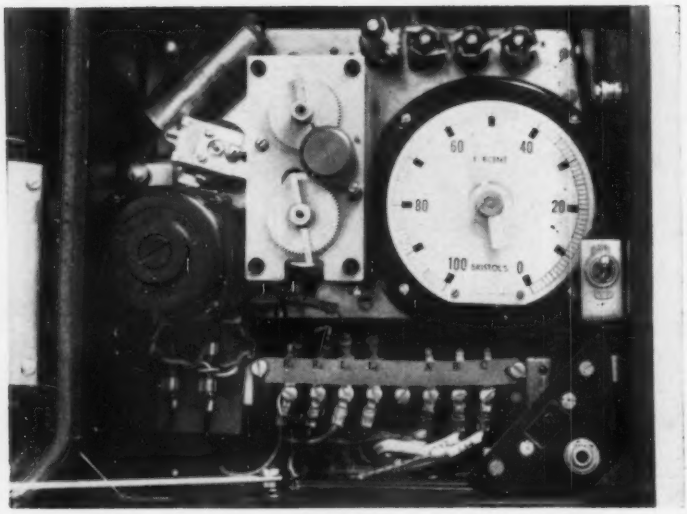


Fig. 4 (left). In this transmitting unit, motion is derived from a meter body and is transcribed into a pulse duration code. Fig. 5 (above). This receiver is where the coded variable is positioned as a point on a slide wire.

At Coxcomb, New York Natural sells to The Peoples Natural Gas Co. by pressure. (*See Fig. 2.*) Line pressure ranges from 650 to 850 psig and is cut to about 150 psig. Usually, valves 15H, 15A, 15B and 15F are open and gas is taken from both lines through an 8-in. station inlet. The entire cut is taken by one set of regulators. A second set of regulators monitors the first.

With such a large cut, heat must be added to prevent hydrate formation. This is done with a temperature controller on the outlet gas to regulate the amount of steam entering the heat exchanger. As shown in *Fig. 2*, the station consists of four 8-in. orifice runs. There is one primary orifice run and differential limit controllers on the other three. The flow through this station ranges from 0-80 MMcfd.

At Petersburg, gas is sold to The East Ohio Gas Co. by volume. (*See Fig. 3.*) The line pressure is about 600-700 psig and is cut to about 400-450 psig. The station consists of six 16-in. orifice runs. Each run is operated individually by an 8-in. regulator. The volume ranges from 200 to 450 MMcfd.

At Coxcomb, where gas is sold by pressure, the company knew it could operate this station remotely if it knew: (1) line pressure, (2) customer's pressure, (3) temperature of the gas, and (4) flow going through the station. These properties are reported to the dispatcher hourly by the pressureman. Such variables must be known at the control point for the following reasons: (1) the dispatcher must know the line pressure to maintain sufficient pressure throughout the system, which is the main purpose of his job; (2) the Peoples pressure is an absolute necessity as sales are on a pressure basis; and (3) since there is a cut from 750 to 150 psig, the temperature of the outlet gas is important because hydrates would occur if heat were not added. If the boiler failed or some mechanical failure occurred, some of the potential trouble could be avoided by having a bell and light alarm go off when the gas outlet temperature reached 35 deg F. This warning would give enough time for a man to reach the station and add alcohol or find the mechanical trouble. Finally, (4) the flow which determines the volume is important to all concerned.

The variable necessary for operation is measured and transmitted to the dispatching center by a five-second Bristol pulse-duration transmitter. In the pressure transmitters, helical springs are connected to the billing meter gauge lines by a tee. This element supplies energy needed to transform a measured variable into an electrical impulse. Initially, square root cams and scales were used on these transmitters. But since the measurement segments decrease in size as the magnitude of the pressure increases, the engineers changed to linear cams and scales, feeling that greater accuracy and readability would be obtained.

The square root is now to be extracted in the pressure slidewire instead of by the rotating cam method.

On flow, there are linear cams and scales whose motion is derived from Barton dri-type meters. The square root is extracted exactly as is the pressure. The measured variable is transmitted from one side of the panel board to the other, where it is positioned as a point on a slidewire in a Wheatstone Bridge. (*See Figs. 4 and 5.*)

Since sales are by pressure and the runs cannot be operated individually from Pittsburgh, flow in all operating orifice runs is totalized at Coxcomb. This flow is referred to as uncorrected Q, which is the differential pressure taken at a 200 psig static pressure, 0.605 gravity, 40 deg F and 1.02 super-X. It is readily seen that our operating conditions would very seldom, if ever, duplicate this average set of conditions. To correct for existing conditions, a second computer in the dispatcher's office applies the following equation to arrive at the correct flow in MMscfd: Q corrected = Q uncorrected

$$\frac{P}{200 \text{ psig}} \times \frac{F_t}{40^\circ} \times \frac{F_g}{.600} \times \frac{F_{pv}}{1.02}$$

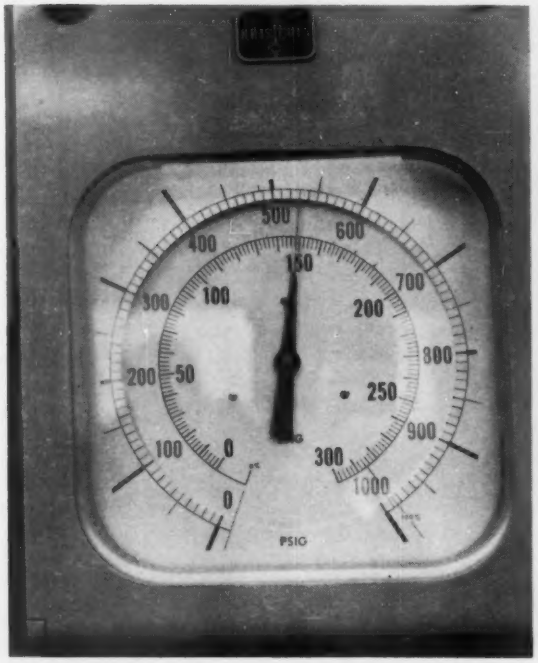
After a measurement of the differential is obtained it is put into a pulse duration code by the linear cam in the transmitter. The transmitter is connected with metallic leads to the receiver which, in turn, positions a brush on the slidewire, forming one leg of a bridge circuit. Direct current is applied by a 10V-45ma power-pack to each receiver. The cam interrupting this circuit energizes and de-energizes the relay in the receiver to position the brush on the slidewire.

The flow slidewires are connected to the totalizing dynamaster, which applies the reference conditions to arrive at the uncorrected flow of the station.

Tone is used as the intermediate link between field and office. New York Natural leases a voice grade channel from the Bell Telephone Co. to transmit signals into Pittsburgh, which is also a full duplex system. Each function being transmitted to Pittsburgh is assigned a particular frequency. The lowest frequency being used is 465 cps and the maximum is 2100 cps. The frequencies are generated by Hammarlund tone generators. These consist of a tone generator, fixed coil, and capacitance that produces a particular frequency. The cam in the transmitter determines duration of the pulse at that particular frequency. It is then transmitted over metallic leads, along with all of the other transmitting frequencies, to Pittsburgh. At Pittsburgh, a particular frequency excites a Hammarlund tone receiver tuned to that frequency. The duration of the pulse is accepted by a receiver working in conjunction with the tone generator to position a brush on the slidewire. Each variable, with the exception of temperature, can be flashed on a common indicator dial by a selector switch located on the dispatcher's desk. (See *Figs. 6 and 7.*)

All variables are recorded on a strip chart by a metagraphic receiver in the dispatcher's office.

All transmitters are checked in the field by a dead weight tester, water manometer or test thermometer. Transmitters and receivers are calibrated monthly, or when the corrected flow varies more than 3 or 4 per cent for a period of time, from the flow deter-



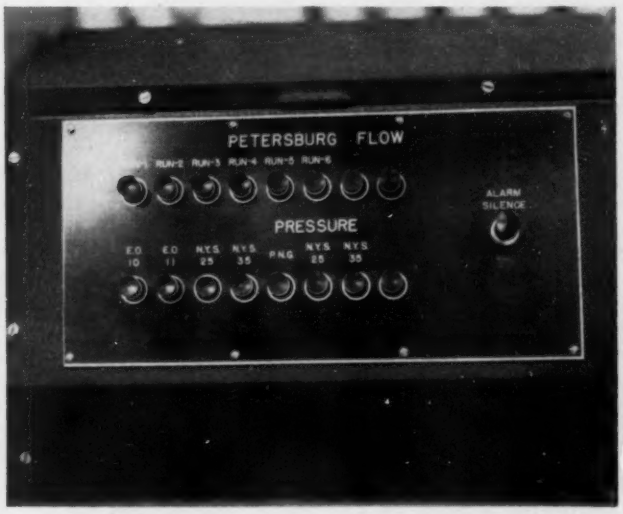


Fig. 6 (left). A 12-in. common indicater is used for increasing the readability of the measured variables. The dispatcher records these readings on his logging sheet. Fig. 7 (above). The switch box, located on dispatcher's desk, is used by the dispatcher in selecting the desired variable to be shown on the common indicator.

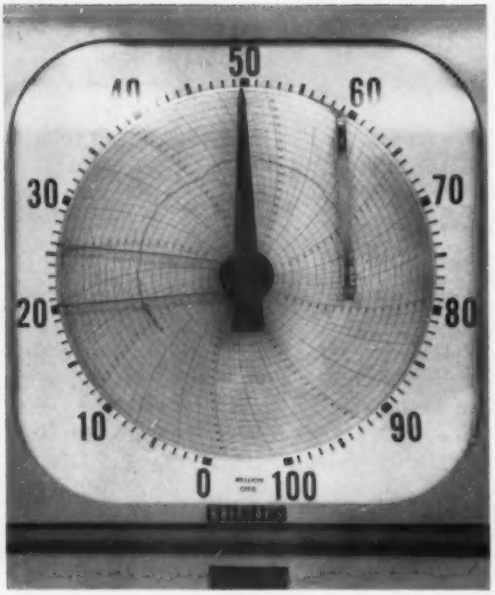
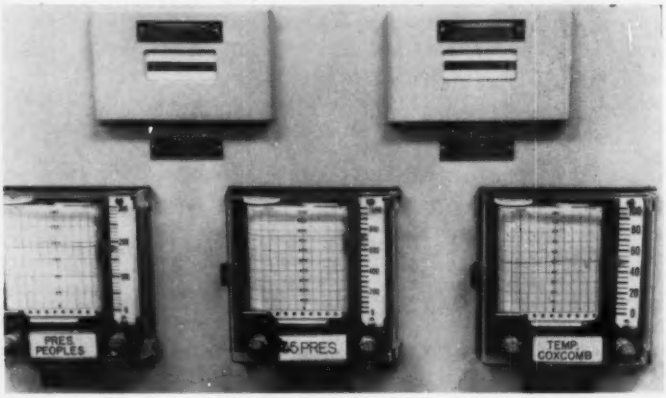


Fig. 8 (left). A dynamaster is where the corrected flow is indicated by a pointer and is recorded on a 24-hr chart. Fig. 9 (below). At the top of the panel are the integrator counters. They totalize flow for an integrated period of time. Metameter receivers, shown in the lower portion, record variables at the master station.



mined by integrating the billing meter charts.

The pressure is regulated with a Bristol 500 Series free-vane controller. This is done with a reversible motor changing the set point on a special cut cam.

All readings at Coxcomb concerning the operation of the station are also shown or recorded on the panel board in the dispatcher's office.

The operation at Petersburg is entirely different from that encountered at Coxcomb. Sales are by volume and the quantity of gas is four to five times larger. This sales station is set up to transmit temperature and pressure of each line and the flow through each individual run. These flows are transmitted to Pittsburgh individually. Each pressure and flow variable is recorded, put into the dynamaster for computing the flow, and then, by selecting the switch associated with that particular function, indicated on a 12-in. common indicator. The temperature cannot be flashed on the common indicator.

On the main panel board, located in the Pittsburgh dispatching office, there are two dynamasters for each of the Petersburg lines and one for the Coxcomb line. There are also 12 Metameter recorders and 16 slidewire receivers. Variables are recorded on 4-in. strip charts and set into the bridge circuit by a receiver positioning a brush on a slidewire. The dynamaster consists of a null bridge computer in which the flow is totalized at the reference conditions in the first dynamaster and then corrected to the existing conditions in the second dynamaster. An integrator receives a 0 to 9-sec. impulse from a transmitter in the dynamaster. The transmitter's cam follower is positioned by the motor in the null bridge circuit. The d-c applied to the bridge is supplied by a Hammarlund DDA. This rectifier supplies current to all of the instruments located in the Pittsburgh office.

The dynamaster records on 24-hr charts and indicates, by means of a pointer on the outside face of the dynamaster, the same reading that is being recorded. The integrator has a digital read-out which totalizes the flow indicated by the dynamaster. (See *Figs. 8 and 9.*)

The alarm system works off the metagraphic receivers. It consists of a bell which rings when the upper or lower limit setting is reached. The only way to silence the bell is to push a silence button which is located on the panel board or control box. The light system consists of a red light for the high limit and a green light for the low limit. These lights will remain on until the condition is corrected. There is also a light and a bell to indicate failure in the transmission circuit.

A small natural gas or gasoline engine generator located at both remote stations takes over immediately in case of a power supply failure to the remote station equipment.

The supervisory equipment is Union Switch and Signal's 531 system. It is set up so that the particular function is accomplished by three relays—one to raise, one to lower and a third that is common to that particular function. Because of the limited number of units, they can be controlled in this manner. The

control equipment is set up on a 24-step code cycle which is accomplished with 13 relays. The first relay checks the circuit on the first round and acts as the 13th step in the second round. The 12-step does not operate the second time through. Its step is performed by a CT relay which operates as the 24th step. The function of the 24th step—the last step in the counting chain—is to close the circuit between the master station and the remote station. The command is given by a timer which limits the amount of time the motor to a particular regulator is energized. The timer is like a stop watch that works in reverse. It permits a certain number of seconds to be selected and starts to count off at the dispatcher's discretion.

The regulators are 8-in. Chaplin-Fulton and are equipped with Oil-dyne pumps and cylinders. The cylinder contains a piston and a two-piece rod, one section of which protrudes out of the top of the cylinder. The other half extends through the other end and connects to the valve stem by a coupling. The rod is joined together in the piston by threads. Teflon O-rings, over rubber O-rings for memory, enable the cylinder and piston to hold a differential pressure within the cylinder very well. The pump uses two gears which mesh together to move the oil through it.

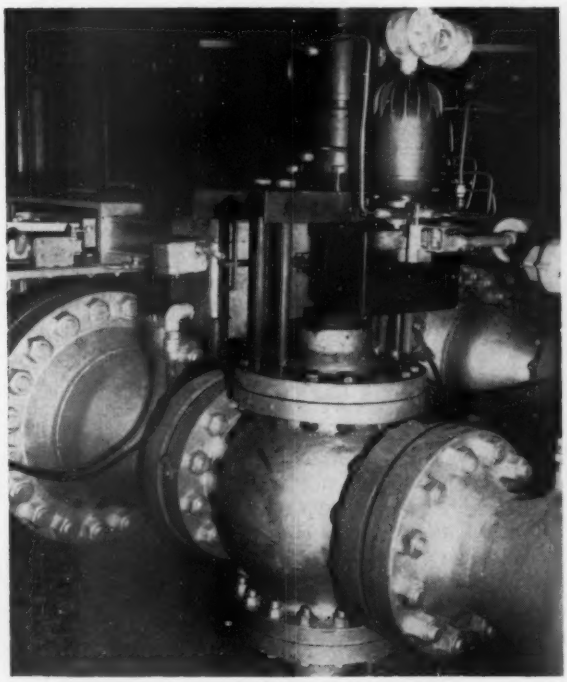
Oil is picked up by the gears, after meshing, and both streams of oil are joined together on the other side of the pump. Oil is returned to the reservoir by using a slotted spool and spring arrangement. Two springs of equal force are selected, one for each side of the spool.

When oil is pumped in one direction, the oil pressure plus the force of the spring will overcome the force exerted by the lone spring opposing them. The spool will then shift into such a position that the sum of the forces exerted in opposite directions will equalize themselves.

The spool has a solid center with horizontal slots cut into its exterior surface. The slots are long enough to provide passage for the oil under the O-rings back to the oil reservoir. The O-rings which are being by-passed enable one side of the cylinder to drain off. The spool is also floating on the O-rings. The spool will continue to bleed off the cylinder until the forces exerted on the spring become unbalanced and seek a new position. When this position is such that the oil no longer bypasses the O-rings, the remaining oil is trapped in both sides of the cylinder. The pressure is retained in the cylinder by check valves located within the pump. O-ring seals are used to great advantage in the construction of the Oil-dyne pump.

The pump is equipped with internal and external pressure relief switches to prevent over-pressuring the equipment. The Oil-dyne pump is small enough to be held in the palm of one's hand. Yet it is capable of producing pressures up to 7000 psig.

If a change in flow is desired, the motor is energized for a selected period of time. The motor is connected to the gears in the pump by a flat shaft slotted at both end which fits both the motor and pump shafts. The motion impressed on the motor shaft is duplicated by the gears. Oil is then pumped through copper tubing to either the top or bottom of the piston, depending on which direction of travel is desired. The piston and valve stem are joined by a



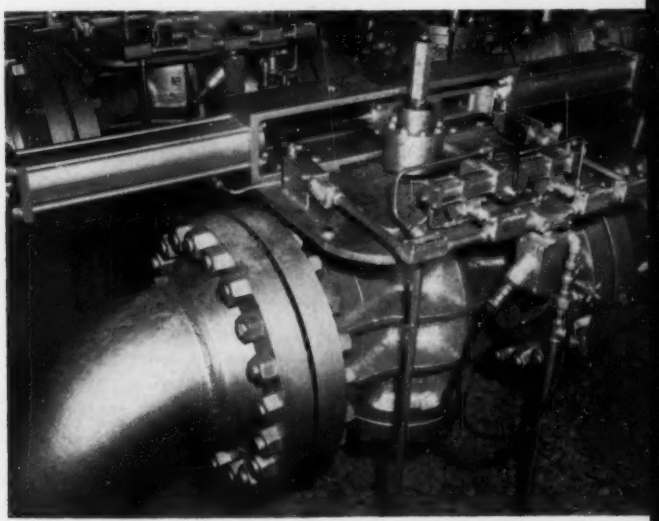


Fig. 10 (left). Eight-inch regulator installation equipped with an oil-pump type operator controlled from the master station. Fig. 11 (above). Cylinder-type valve actuator opens and closes a plug valve, assuring tight shutoff.

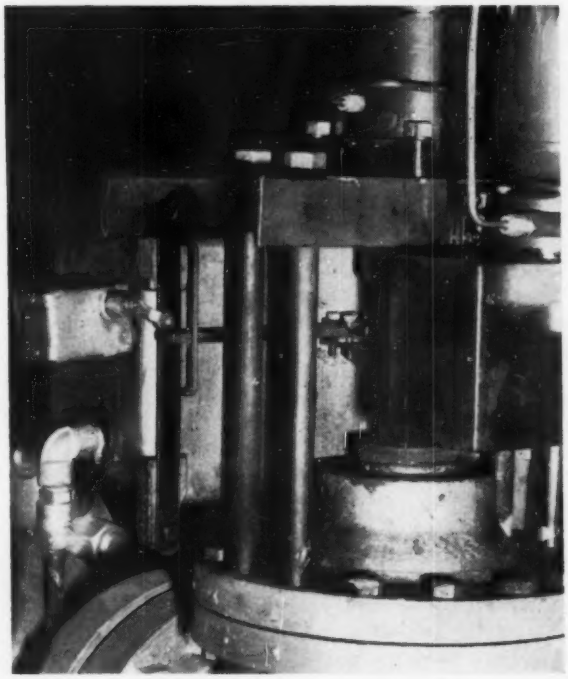


Fig. 12 (right). A microswitch actuated by the regulator movement triggers the operation of the plug valve. This is an enlargement of Fig. 10.

Master station is in New York Natural's dispatching department. Petersburg and Coxcomb measuring stations are remotely controlled from this panel board.

union, thus the travel of the piston is duplicated in valve travel. A rheostat is connected in series with the motor circuit which will control the speed of the motor and indirectly the quantity of oil pumped into the cylinder. The regulator has 1.875-in. valve travel and is set to travel the 1.875 in. in between 100 and 120 seconds. (See *Fig. 10.*)

The plug valve (*Fig. 11*) is equipped with a Ledeen operator. The operator has two cylinders and two pistons, one cylinder and piston located on each end of a piston rod. Gas pressure is applied to each cylinder, producing an equal force on each piston in the direction desired. Gas is routed into the cylinder by a three-position, four-way valve. The four-way valve is controlled by a pilot valve which is triggered by a microswitch. The microswitch is closed or opened by the position of the valve stem. An arm mounted on the valve stem trips the switch after a travel of 0.0625 in. This assures that the plug valve will open only after the valve stem comes off its seat and is on its way open. As a safety precaution against the plug valve opening by itself for some unforeseen reason, a relay in series with the circuit will permit the plug valve to open only on an "up" signal from the dispatcher's office. Only on this signal will the relay be energized, putting power up to the microswitch to start the plug valve operator functioning. (See *Fig. 12.*)

The two lines at Petersburg can be isolated after measurement by working the actuator on the plug valve located on the crossover and operating it from Pittsburgh. This crossover has the same operator as described above minus the microswitch. The pilot valve is energized directly. (See *Fig. 3.*)

At Coxcomb, there is a Ledeen cylinder and Oil-dyne pump on Gate 15K and an Oil-dyne cylinder and pump on Gate 15E (See *Fig. 2.*) The first operator is set to close or open the gate in about 12 minutes. The latter takes four minutes to open or close. The time delay protects the billing meters from having the mercury blown out. This delay in the gate gives protection needed for the billing equipment. The operators work exactly as do the operators on the regulators. A pressure switch located in the pump will break the circuit to the motor at any pressure desired. This occurs when the piston has reached the end of its travel and starts to build pressure behind the piston. The direction of the gate can be reversed while in travel, but the end position of the gate has to be one of the limits.

Using the system described, New York Natural has experienced better regulation and control of these two stations than when the instruments were operated manually. ■

GAS exclusive

By A. C. DUDLEY, Assistant to the General Superintendent, Hartford (Conn.) Gas Co.

Hartford Gas reports on the

Intermediate gas method of conversion

AT 3 p.m. Sunday, Aug. 9, 1959, with the opening of a mainline valve on the natural gas supply, regulators took over the job of maintaining constant gas pressure on the intermediate pressure line looping the City of Hartford, Connecticut. Thus, an old era ended and a new one began.

After a 110-year history of distributing manufactured and mixed gas, Hartford Gas Co. became a natural gas distributor. Although since 1953 an 800-Btu mixture of manufactured and natural gas had been distributed, it was not until 1957 that natural gas was sold directly to the company's customers without mixing. It was in that year that the appliances of some 14,700 customers were converted from the use of 800-Btu mixed gas to straight natural gas. In 1958, appliances of another 15,500 customers were converted, and in 1959, the remaining 45,600 were completed.

In all, over 150,000 appliances were converted at a total cost of some $930,000. This, coupled with a conversion in 1953 of these same appliances from 528- to 800-Btu gas at a cost of $1.5 million, adds up to a cost of about $32 per customer. The expense was absorbed entirely by the company.

Aside from being done over a seven-year period, Hartford's conversion from manufactured to natural gas has been unique from another standpoint—that of method used. Most conversions are made by sectionalizing; i.e., isolation of small areas, usually about 1000 to 2000 users, and replacement of manufactured gas with natural gas before the conversion operation is started. A few conversions are made by supplying a gas of intermediate heating value to a much larger area without sectionalizing and introducing natural gas after completion of the conversion adjustments. Hartford used the regular intermediate gas method in 1953, but modified it in 1957, 1958, and 1959 by reducing the area into five sections of about 15,000 users each. (See *Fig. 1.*)

The intermediate gas method of conversion was selected for the following reasons:

1. Less expensive. Sectionalizing would require installation of a large number of valves or other flow stopping devices to isolate some 37 sections. The testing and purging operation would require additional manpower for long hours.

2. Fewer men required, although for a longer time. About the same number of man hours would be required for appliance adjustments by either method, but the smaller group of men could be trained better, checked more closely, and obtained more easily. Inspection would be more effective.

3. Less customer inconvenience. Customer would retain full use of all appliances throughout the conversion, although overgassing and undergassing would cause some inconvenience. Sectionalizing causes loss of use of certain appliances for periods of up to two or three days.

4. Less C.G.I. trouble. Instead of requiring entrance to each customer's premises within a specific two- or three-day period, entrance could be delayed over a much longer period with safety.

5. No reversal of flow in mains. Since there would be no change in supply sources, there would be no change in flow direction and no "dust storms" to worry about.

The advantages of the intermediate gas method appeared to outweigh the disadvantages. The necessity of making final air-gas adjustments on a gas of lower Btu and specific gravity from the gas finally supplied would be a distinct disadvantage.

In 1957, Area 1, which included three towns and 14,700 gas users, was isolated from the remainder of our system with little expense and no difficulty. Being located across the Connecticut river from the city of

Hartford, it had been supplied with gas through a separate high pressure system. It was a simple matter to supply, first a 900-Btu gas mixture for the conversion operation, then, the final natural gas without interference in the supply of 800-Btu gas to all other customers. Although insufficient qualified manpower made it difficult to maintain the planned schedule, Area 1 was converted in six weeks by 74 men. The work was done during August and September.

In 1958, Area 2, which included 15,500 users in the town of Bloomfield and the northern section of Hartford, was isolated for conversion by installing six main valves. Area 2 was supplied by gas through district regulators from a looped intermediate pressure system which was divided into two parts by closing a valve. One side of the loop was supplied 800-Btu gas, while the other side was supplied 915-Btu gas and, after completion of conversion, straight natural gas. In Area 2, the gas heating value was increased to 915 rather than 900 because of utilization experience gained from 1957 conversion. It was found in Area 1 that, while the intermediate gas was in the system and after an appliance was converted to proper natural gas input, thermal safety devices often did not receive enough heat to maintain them in open position and would cause a "no gas" call. It was found that an additional 15 Btu's corrected the difficulty and did not over-gas unadjusted appliances beyond a safe limit. Area 2 was converted in five weeks by 93 men during July and August.

In 1959, Areas 3, 4, and 5, including 45,700 users in the towns of West Hartford, Wethersfield, and central Hartford, were converted. It was necessary to isolate each area completely by the installation of 15 main valves. One additional source was required to supply natural gas to section 4. Each valve was checked for tightness prior to increasing the Btu to insure against leakage or the existence of undetected ties between sections and to ascertain that each area had an adequate gas supply. Some district regulators passed more gas than before, but were adequate to handle the requirements.

All gas mixing was done at the Front Street plant located near the center of downtown Hartford. In 1957 and 1958, temporary mixing facilities were used to produce the 900- and 915-Btu gas. In 1959, the regular mixing facilities were used, as only one mixed gas of 915 Btu was being distributed.

On May 3, 1959, the mixed gas Btu was gradually increased from 800 to 915 and supplied to Areas 3, 4, and 5. The 800-Btu gas was purged from mains by normal gas consumption. No increase in the number of service calls was experienced from the resultant overgassing.

The conversion men arrived on May 4, 1959, and were briefed on company policies, reasons for the conversion and the method being used, followed by sessions with actual appliances to demonstrate the proper adjustment for natural gas on the 915-Btu intermediate gas. The force of over 100 fieldmen then began the task of changing orifices and adjusting air shutters in Area 3. Area pressures were checked to be sure inputs would be correct.

Constant pressure was important throughout the conversion. Pole type recording pressure gauges at each regulator vault, pressure gauges in customers' homes and at the holder stations were used to check pressure conditions.

Five weeks after the start of the conversion of Area 3 on June 10, all domestic and C&I appliances in the area had been converted. Due to a high concentration of central heaters in Area 3 and the limited

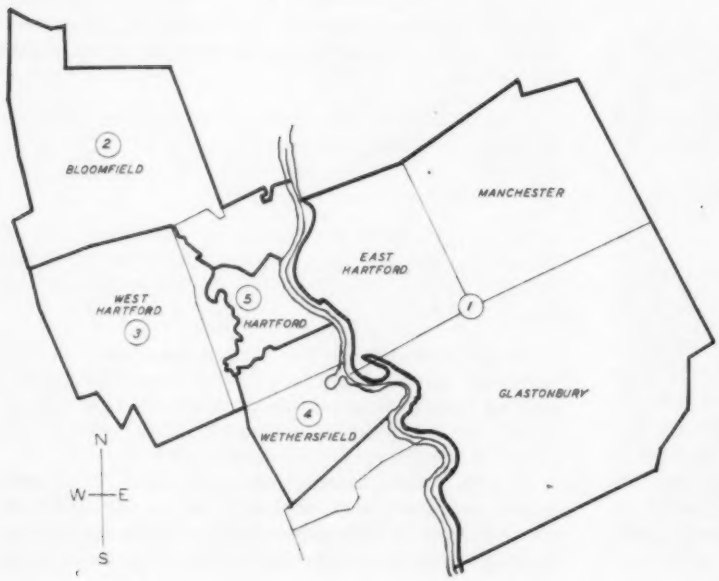


FIG. 1. Hartford Gas Co.'s conversion areas.

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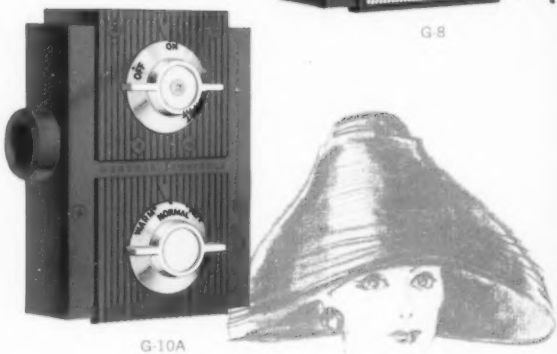
—and for several reasons. Every member of the family . . . from the competitively priced G-10, through the stylish G-8 and G-9, to the luxury-designed G-11 . . . adds exciting sell to your water heater lines. There's real economy in the dimensional interchangeability, universal pilot filters and optional built-in pressure regulation. And the name General Controls on every control assures you of precision quality.

The deluxe G-11 offers you *unlimited* combinations of colors and trims. Handsome textured metallics combine with any color you choose. The G-8 and G-9 are available in virtually the same combinations, and the budget-priced G-10 offers lustrous enamel finish with attractive twin-dials in five colors: black, white, red, blue and green.

HIGH CAPACITY is the big difference between the G-11 and other water heater controls. You are assured of capacity well beyond the toughest load requirements.

BUILT-IN PRESSURE REGULATOR on the G-11 offers full-range adjustment—and on the front of the control. To be certain the pilot flame is never starved, only the main burner gas flow is regulated.

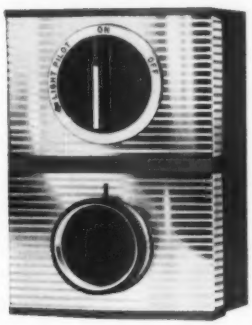
G-8



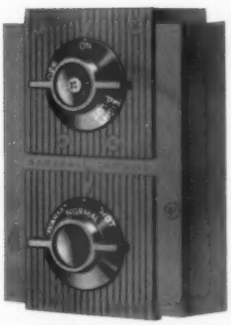
G-10A

G-9

G-11A

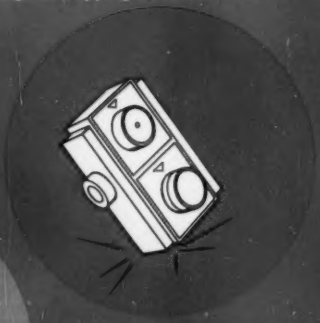


G-11R



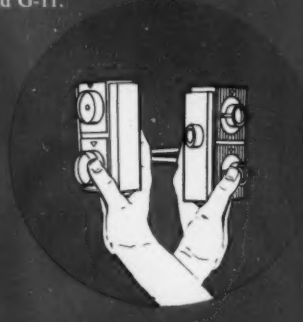
G-10R

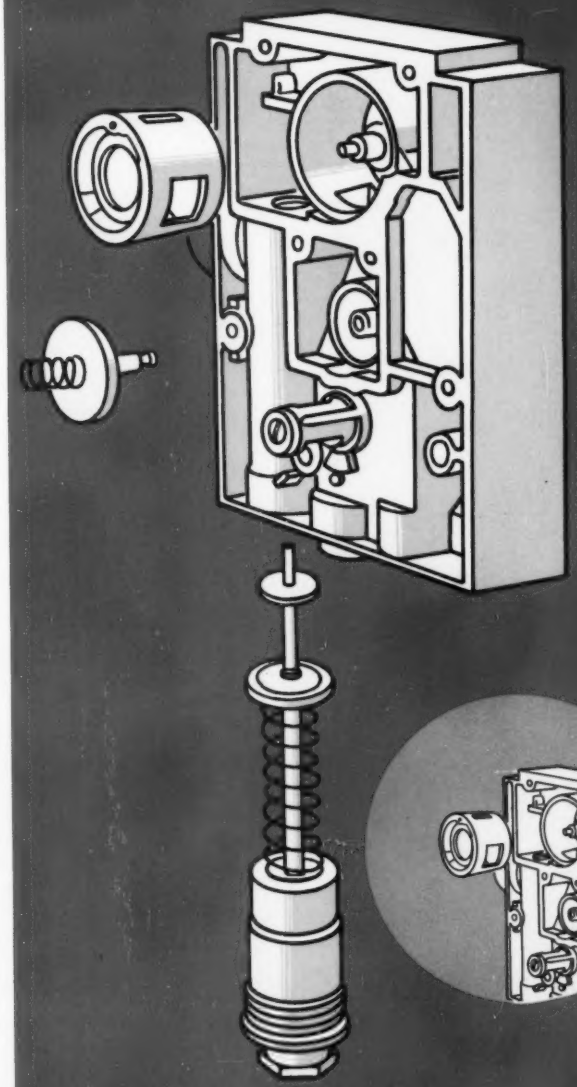
RUGGED CONSTRUCTION in the heavy walled aluminum body prevents damage in shipping or installation.



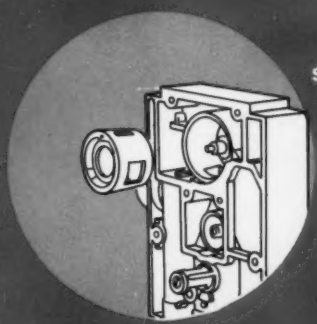
BUILT-IN PRESSURE TAP is an optional feature on all regulator models. Pressure tap is easily accessible at bottom of control.

DIMENSIONAL INTERCHANGEABILITY between the G-8, G-9, G-10A, G-10R and G-11.

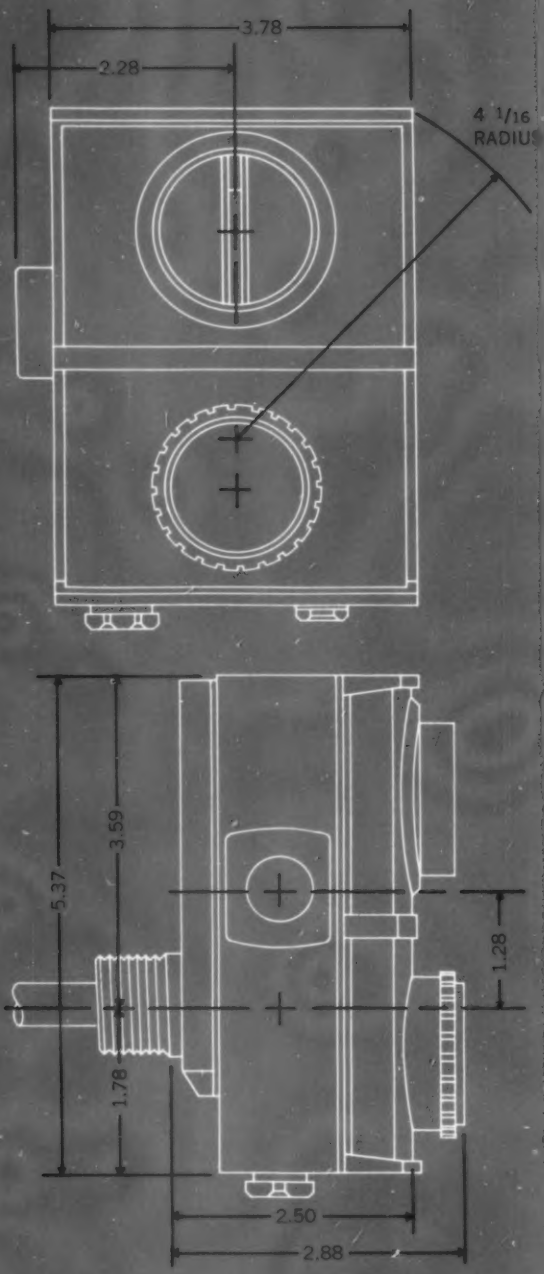




ROTARY RESET simplifies lighting of the heater. Lighting procedure is three easy steps – simply turn knob . . . no reset button or complicated interlock involved.



SUPER-HARDENING PROCESS used in the manufacture of the gas cock prevents freezing or galling, assures lifetime of leak-proof service.



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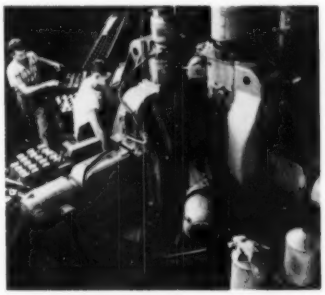

GIANT KINGSBURY multiple operation machines and other high precision manufacturing equipment help to guarantee efficiency of manufacturing methods. This is reflected in the fine quality products produced by General Controls.

PERFORMANCE TESTING is only one of many quality control operations in General Controls constant effort to maintain the highest reliability in the industry.

HOSPITAL CLEAN thermo-magnet room guarantees reliability of thermo-magnet performance. Here, assembly of critical components in a surgically clean atmosphere eliminates the smallest dust particles and insures long service-free performance.

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number of conversion men qualified to convert them, there were many central heaters unconverted on June 10. A decision was made to shut down all unconverted central heaters and turn natural gas into Area 3 and have domestic crews go on to Area 4, leaving the heating crews in Area 3 to complete their work. For the first time in many years, the weather turned cold enough in mid-June to require heat. It became necessary to relight each unconverted central heater and give the customers temporary heat by throttling the "A" valve and making an air adjustment. This temporary measure sufficed until a complete conversion was made. Area 4 was completed four weeks later on July 6, and Area 5 was completed on Aug. 9.

A special sales effort was tied into the 1959 conversion. In both 1957 and 1958, attempts were made to obtain good sales prospects from conversion fieldmen by screening customers' need for new appliances. Their screening was based primarily on the age and condition of the customers' existing appliances. A bonus was offered to the men for each prospect that resulted in a sale, but these attempts were unsuccessful in turning up any volume of sales.

In 1959, an all-out sales effort was made with much more gratifying results. As before, a bonus was offered to the conversion men for all prospects resulting in sales. But the amount was increased to be on a par with bonuses offered all regular employees under a special Prospect Award Plan for the duration of the conversion period. Extensive advertising in newspapers, on radio, and television promoted a "Natural Gas Jubilee" sale whereby any gas appliance which replaced another could be bought at a substantial saving to any consumer living on the gas lines.

The plan was very effective and resulted in the replacement of 2500 appliances during the 15 weeks the sale ran. Of the appliances replaced, 986 were obsolete pieces of equipment which would have been difficult and expensive to convert. Offsetting some of the expense of the sales campaign was the money saved by not having to convert this equipment.

Based on their difficulty of conversion or expected unsatisfactory operation after conversion, certain appliances were designated as D.C.A.'s (Difficult to Convert Appliances) and were left unconverted. In each such case, the adjuster left a form letter with the customer explaining his action. A sales representative called and endeavored to close a sale at special discount offers of the "Jubilee" sales program.

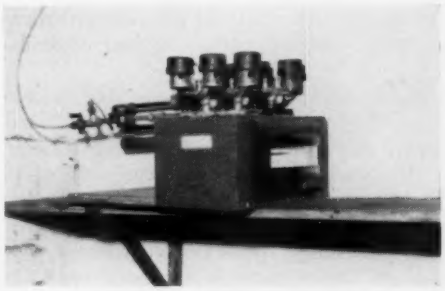
Where a sale could not be made, a second trip to complete the conversion was necessary, thereby increasing the conversion cost. Where a sale was made, however, there was no conversion expense and, in many cases, a substantial saving resulted.

With every conversion there is a deterioration in customer relations in spite of all efforts made to overcome the problem. Hartford's customers have been exposed to two conversions within a seven-year period. Every attempt was made to maintain good relations during conversion and after conversion to reestablish good relations.

In 1953, it was discovered that replacement of many parts normally charged for had to be done at no charge. This was especially true of safety controls which, to the customer's knowledge, functioned perfectly before conversion. Such replacements were made free in 1957, 1958, and 1959 and proved helpful in maintaining customer satisfaction. Numerous newspaper articles and direct mail letters giving the reason for the conversion and notices of progress kept the customer informed. "Thank You" letters for the customers' part also proved beneficial.

In addition, after completion of the conversion in 1959, self-addressed post cards were sent out as bill enclosures to customers in Area 3. The customers were asked to check the following:

( ) My gas appliances are operating satisfactorily.
( ) I believe that my ..... needs further attention.
appliance(s)
( ) I would like to have further information about
.....



Pilot-dust instrumentation.

Of the 11.1 per cent returned, 67 per cent expressed satisfaction with appliance operation, while 33 per cent requested a call for information or service. If it is assumed that customers with unsatisfactory appliance operation returned their cards, less than 2 per cent of the appliances converted in 1959 did not operate properly as a result of the conversion. This unsatisfactory operation was due to two major causes—poor workmanship during the conversion, and appliances that were not suitable for combustion of natural gas without further design change. Although the post cards brought additional work load to an over-burdened service department, the better public relations that resulted made it worth while.

The most prevalent complaint resulting from conversion was the ignition problem on range top burners. The fineness of adjustment needed for good ignition with natural gas was difficult to achieve when making a conversion with an intermediate 915-Btu gas. In many cases, adjustments made to permit satisfactory ignition with 915-Btu gas had to be readjusted for good ignition of natural gas.

Another problem with ranges, known as streamers, was solved by increasing the size of top burner bowl openings to permit increased air flow around burner. It eliminated the need for elaborate packing of ovens and construction of special shields. While not always successful, it saved hundreds of dollars of labor and materials on streamers.

Hartford has experienced leakage due to drying out or disintegration of packing in cast iron bell and spigot joints. Probably due to the extended period over which the change from manufactured to natural gas was made, the severity of the problem has increased gradually, allowing time for corrective steps to be taken.

Prior to conversion to mixed gas in 1953, Hartford added hot oil fogging to the steam saturation method then in use. The benefits of this combination treatment during the distribution of 800-Btu mixed manufactured and natural gas was excellent except on pressure lines with bell and spigot joints where gradual drying out of joints increased leakage. A joint clamping program and manhole and vegetation surveys have helped to keep joint leakage under control.

Since Aug. 9, 1959, when the company completed conversion to 100 per cent natural gas, steam hydration was eliminated and only hot oil fogging of mains continued.

One problem Hartford did not experience was drying out of meter diaphragms. Sixty per cent of Hartford's meters are equipped with synthetic diaphragms. The leather diaphragm meters are accurate and in good condition. This is undoubtedly due to the clean coke oven gas distributed as base load since 1928.

Since 1952, meter accuracy has continually improved. Based on the increase in accuracy, the Connecticut Public Utilities Commission in 1959 approved an increase in the test period from seven years to 10 years for meters of 240-cu ft capacity and smaller.

The problem of dust movement in dry mains was detected by a special instrument (see *Fig. 2*) to bring such movement to light before it became a major problem. Unfiltered gas is burned at six Rutz-type pilots with the flames enveloping thermocouples. The thermocouples then terminate in a Bristol Pyrometer where a millivolt reading is taken daily and recorded. As the pilots become partially plugged with dust particles, the millivolt reading decreases, the rate of decrease indicating the amount of dust in the gas. By placing such instruments at strategic locations, Hartford has been successful in detecting dust movement promptly. The feeder mains supplying the area are immediately treated with a gravity flow of oil capable of saturating the dust in the mains.

One benefit of the use of a higher Btu natural gas has been the reduction in number of distribution areas with low pressure. It is felt to be only a temporary relief as increasing load due to expanding sales, especially of volume use, will use up the added main capacity. We plan to have our engineers review our distribution planning in all areas. A predicted increase in the heating load saturation for each load center will be calculated and the necessary distribution system feeder main additions determined to provide adequate pressure for future load growth. ■

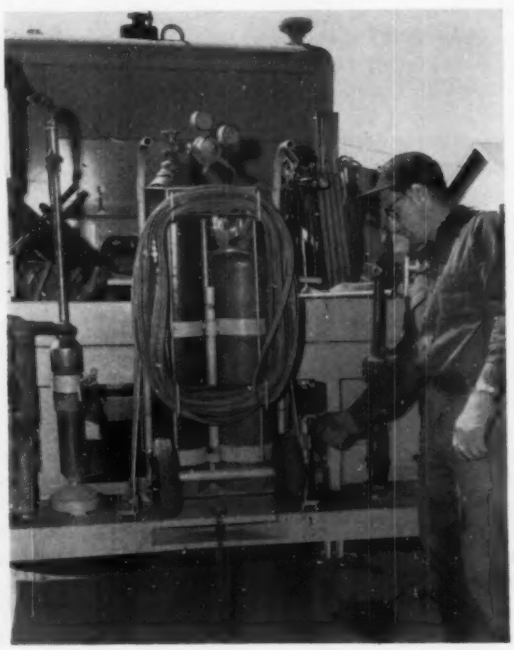
Arizona PSCo. crew develops

Welding cart carrying method

AFTER gas crewmen for Arizona Public Service Co., Phoenix, got their new 4-in. miniature ditching machine, which was to be towed behind a truck, they didn't know what to do with the welding outfit that had been using that spot.

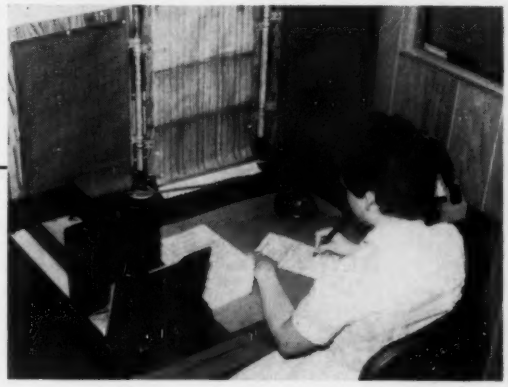
They solved the problem by designing a small portable cart which could carry both the acetylene and oxygen tanks and be firmly attached to the back of the truck. Loading is done by a tilting rack that swings down and engages two legs on the cart. One man on each side then raises the cart and swings it onto the truck. A locking assembly holds the cart in place.

The locking assembly and an angle iron welded to the bottom of the carrier provide stability. In traveling position, the bottom front of the cart base hooks under the angle iron and prevents the cart from moving up. When the truck is in motion, weight of the cart is supported by the carrier where it engages the knobs of the cart. ■



Gas meter reader relays customer's reading to billing clerk.

Control operator posts reading onto translucent combination ledger-card statement form.



Then whiteprint machine reproduces original onto sensitized paper for billing purposes.

Meter reading by radiophone

ON-THE-SPOT broadcasts from gas and water meter readers to billing clerks help eliminate errors and save time and money for the city of Dublin, Ga.

The city, which serves over 6000 gas and water customers, has equipped each of its meter readers with a Handie Talkie radiophone. When the reader is at a customer's meter, he calls in the reading to the billing department, where the control operator posts it onto a translucent combination ledger card-statement form with a Radiograph pen. The ledger card-statement forms are arranged in the same sequence as the meter reader's route, which facilitates synchronization between the reader and the control operator.

If a reading looks "out of line," the control operator requests a recheck while the reader is on the spot. While the reader is walking to the next meter, the control operator computes the consumption, extends the amount, and places the card in the file box for reproduction on a white print copying machine.

A desk-sized Ozamatic white print machine, made by the Ozalid division of General Aniline & Film Corp. (Johnson City, N. Y.), reproduces the ledger card-statements directly onto sensitized single coated paper. Each copy is an exact reproduction of the original. Average time to produce each statement: less than 30 seconds. The statement is perforated so that the stub which shows the name and account number can be mailed to the customer and returned with the remittance, assuring proper credit.

Under the city's old system, the meter reader was provided with a book into which he posted each reading. When he completed a route, he turned in the book to the billing department. There it was reviewed for any obvious errors—such as a sudden increase or decrease in consumption.

Under the new system, these errors can be spotted by the control operator as she posts, and if the meter reading is in question, the reader can check immediately for accuracy rather than having to return later. Readings were previously transcribed to a stub-type postcard with a posting machine and bills had to be proofread for accuracy before mailing.

Dublin reports the following benefits from its new "direct broadcast-direct copy" system:

—Eliminates review of readings which previously required 10 days.

—Eliminates reading rechecks of errors caught in review.

—Eliminates changing about 100 addressing plates per month, which required eight man-hours.

—Eliminates addressing 6000 postcards each month.

—Has reduced billing time from 15 days to 2 days.

—Eliminates proofreading of postings.

The greatest benefit derived from the new system has been positive control of the meter readers' reports. ■

Natural gas stabilization control for coke oven gas replacement

By J. L. DOSS, Engineer
Industrial Division
Cutler-Hammer Inc., New York

CARNEGIE NATURAL GAS CO. serves a number of domestic customers in the Pittsburgh area. In addition, it has the tremendous assignment of supplying a major portion of fuel requirements for several U. S. Steel Corp. plants along the Monongahela river.

The basic supply for the fuel system to the steel mills is coke oven gas from huge coke oven operations at Clairton. This gas is transported along the hilly route through a twin 43-in. and 55-in. OD pipeline, engineered and constructed by Williams Brothers Co., pipeline contractors. (See "Carnegie Natural Builds a Big One" by William W. Clark, GAS, Oct. 1958, pp 61-67.)

In the operation of the mills, demand for fuel often exceeds the supply of coke oven gas. It is then necessary to augment with a substitute gas having essentially the same burning characteristics, or heat input factor. Natural gas, stabilized with air, is used to supplement the coke oven gas supply.

GAS exclusive

Stabilized natural gas is supplied through a Cutler-Hammer 15-Rate jet compressor system, in the required amount to maintain the system pressure throughout the changing demand. The Btu of stabilized mixture is controlled by a Thermeter to assure constant interchangeability of gases.

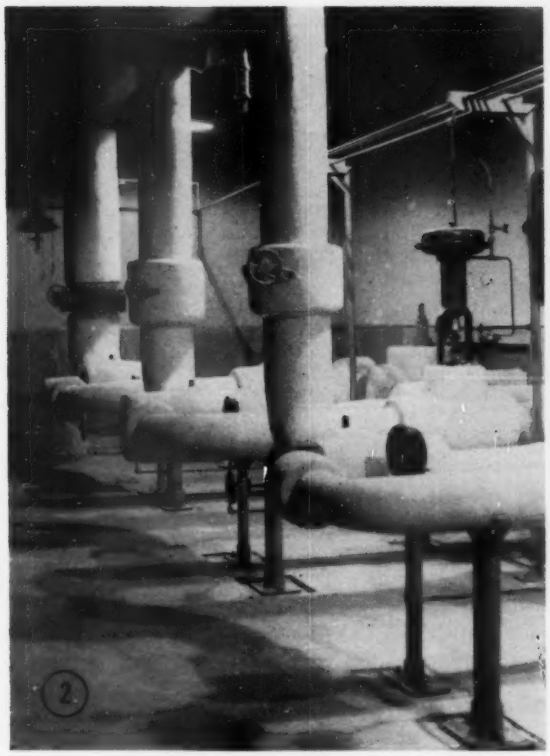
The heat input factor for a gas or mixture is generally defined as: Btu divided by the square root of the specific gravity. The coke oven gas has an average heating value of 581 Btu and a corresponding specific gravity of 0.379. The heat input factor is 943.

Natural gas, having a heating value of 1074 Btu and a specific gravity of 0.62, is stabilized to 800 Btu with 25.4 per cent air. The resultant heat input factor is 943. This mixture is essentially interchangeable with coke oven gas.

The stabilization plant is located at a metering station in Curry Hollow. The 15-Rate jet compressor system admits stabilized gas to the pipeline on pressure demand.

Four gas jet compressors, 4-, 6-, 8-, and 12-in., discharge into a common stabilized gas header.

An air flow-control butterfly valve controls the amount of filtered air entering the suction header common to all jets. A pilot-pressure difference regu-



1.

The 15-Rate selector mechanism (left) automatically selects combinations of jet compressors to match demand. The Thermeter (right) continuously indicates, records and controls the stabilized gas heating value.

2.

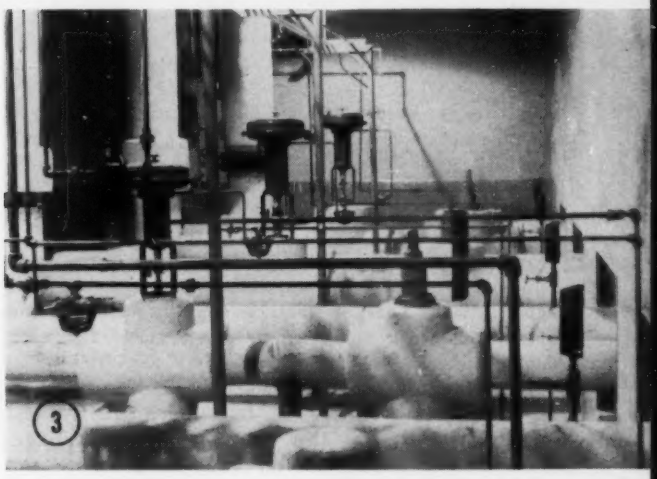
Overhead air header supplies controlled air through down-pipe to horizontally mounted jet compressors. Jets and pipes are well lagged and housed in insulated building to reduce noise.

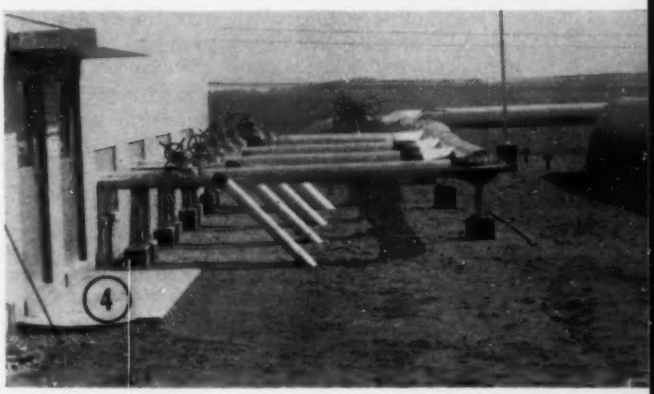
3.

Nozzle gas pressure on each jet compressor is individually regulated (right). Diaphragm-operated nozzle gas shutoff valves (left) are part of 15-rate system.

4.

Natural gas for jet nozzles emerges from the ground, goes into the building and inspirates air through the jet compressors. The stabilized gas passes out of the building and into the stabilized gas header, well designed to keep pressure losses at a minimum.





lator maintains a constant differential pressure between the air suction header and stabilized gas discharge header by positioning the air butterfly valve.

Controlled, constant-nozzle gas pressure provides a constant motive force for inspirating air.

The 15-Rate selector mechanism automatically selects the combination of jet compressors having capacity to match the demand. The selector mechanism is actuated by a sensitive pilot demand regulator according to system pressure. Setting of the demand regulator may be changed either locally or remotely by the dispatcher by pushbutton control.

A Btu adjuster, operated by the Thermeter, changes loading of the pilot-pressure difference regulator and will change the maintained suction-to-discharge differential pressure, as necessary, to control Btu.

The Thermeter continuously indicates, records and controls the heating value of stabilized gas.

The jet compressors in the 15-Rate system are sized so that the next largest jet has double the capacity of the preceding jet. In this arrangement, there are a total of 15 rates of make from zero flow to the maximum of 22.5 MMcfd. With this number of rates, close pressure control is maintained. Throughout the many abrupt load changes on the pipeline, the mills are supplied with uniform quality fuel. ■

Pre-calculation method determines gas volumes

By FREDERICK W. MAYR, Assistant Analyst
Rate Engineering Department,
Consolidated Edison Co. of New York

PRE-CALCULATIONS in tabular form have reduced errors and time consumed in Con Edison's calculations of gas drawn every 24 hours from pipelines.

With only 45 stations for meter recordings, card punching for machine tabulating and calculation is not justified. The new method simplifies clerical and arithmetic work involved in calculations for each orifice meter.

Formerly, the human calculator was given the flowing temperature of the gas, its specific gravity, and its pressure. He was also given an integrator difference. This derived from an integrating device and the orifice size of the meter. To get the Mcf for a 24-hr period, the calculator recorded factors for each of the three first values, the integrator difference, and a constant K which varied with the orifice size. The product of these five values gave him the volume in Mcf.

Now the human calculator has two series of pre-calculated tables. The first gives values for the "Combined Factors" normally experienced *(Table 1)*. This product is then located in a second series of tables *(Table 2)* called the integrator multiplier. This provides him with a pre-calculated product of the combined factors and K. The integrator multiplier is multiplied by the integrator difference to give the volume in Mcf.

An example of the use of the tables illustrates the advantages of the new method. The calculator is given:

Temperature	65 deg
Specific gravity	.590
Pressure	193
Integrator difference	37
Orifice size	8.25 in.

His formula is:

(Ftf) x (f g) x (Fpv) x (Integrator Difference) x K

equals

Volume in Mcf

Where: (Ftf) is factor for flowing temperature
(F g) is factor for specific gravity
(Fpv) is factor for supercompressibility
Integrator Difference is product of square roots of static and differential pressures and time span (derived from integrating device)
K is constant which varies with orifice size

Under the old method the calculator would take values for the three factors from standard tables, derive his integrator difference and apply the proper value of K. His formula would then look like this:

TABLE 1. FACTORS COMBINED*

(Gravity = 590)

TEMP.	PRESSURE								
	170	175	180	185	190	195	200	205	210
24	1.373	1.374	1.375	1.375	1.375	1.377	1.377	1.378	1.379
27	1.368	1.369	1.370	1.371	1.371	1.372	1.373	1.373	1.374
30	1.364	1.364	1.365	1.366	1.366	1.367	1.368	1.368	1.369
33	1.359	1.360	1.360	1.361	1.362	1.362	1.363	1.364	1.364
36	1.355	1.355	1.356	1.356	1.357	1.358	1.358	1.359	1.359
39	1.350	1.351	1.351	1.352	1.352	1.353	1.354	1.354	1.355
42	1.345	1.346	1.347	1.347	1.348	1.348	1.349	1.350	1.350
45	1.341	1.341	1.342	1.343	1.343	1.344	1.344	1.345	1.345
48	1.337	1.337	1.338	1.338	1.339	1.339	1.340	1.340	1.341
51	1.332	1.333	1.333	1.334	1.334	1.335	1.336	1.336	1.337
54	1.328	1.329	1.329	1.330	1.330	1.331	1.331	1.332	1.332
57	1.324	1.324	1.325	1.325	1.326	1.326	1.327	1.327	1.328
60	1.319	1.320	1.320	1.321	1.321	1.322	1.323	1.323	1.324
63	1.315	1.316	1.316	1.317	1.317	1.318	1.318	1.319	1.319
66	1.311	1.312	1.312	1.313	1.313	1.314	1.314	1.315	1.315
69	1.307	1.308	1.308	1.309	1.309	1.309	1.310	1.310	1.311
72	1.303	1.304	1.304	1.304	1.305	1.305	1.306	1.306	1.307
75	1.299	1.299	1.300	1.300	1.301	1.301	1.302	1.302	1.303

* This is a sample of Con Edison's Factors Combined Table, which is 16 pages long.

( ) ( ) ( ) (37) (35.0654) = V in Mcf = 1705.7 Mcf. It is clear the method leaves wide opportunity for both clerical errors and for errors in operating a calculating machine.

The new method eliminates most of these pitfalls. Using his combined factors tables *(Table 1)*, the calculator turns to the pre-calculated sheet for a specific gravity of .590. He uses this sheet like a distance chart on a road map, locating his temperature on one axis and his pressure on the other. At the point of intersection he finds the pre-calculated value, 1.314, for this particular combination of factors.

Turning to his K sheets *(Table 2)*, he uses the sheet for an 8.25-in. orifice, locates the Factors Combined value of 1.314 and reads off directly the pre-calculated value for the Integrator Multiplier of 46.1 (1.314 times 35.0654).

His formula then appears as:

(46.1) (37) = V in Mcf = 1705.7 Mcf

Con Edison has prepared the pre-calculated series for Factors Combined and for Integrator Multiplier to cover the ranges of pressures and values of K normally experienced. Reductions in work load and reduced errors more than justify the time spent in pre-calculation. The tables lend themselves to card punching and machine tabulating as well as to hand calculating.

These tables, in addition to their daily use in calculating gas volumes drawn by Con Edison, have also been in daily use at the Hell Gate and Astoria generating stations for the past year and a half. The tables may be used at other locations on the Con Edison system in the near future. ■

TABLE 2. INTEGRATOR MULTIPLIER*

Station ..... HELL GATE
Meter Tube # ..... Orifice 8.25″
Coeff with Machine K 35.0654

Fact Comb	Int Mult	Fact Comb	Int Mult	Fact Comb	Int Mult
1.270	44.5	1.310	45.9	1.350	47.3
1.271	44.6	1.311	46.0	1.351	47.4
1.272	44.6	1.312	46.0	1.352	47.4
1.273	44.6	1.313	46.0	1.353	47.4
1.274	44.7	1.314	46.1	1.354	47.5
1.275	44.7	1.315	46.1	1.355	47.5
1.276	44.7	1.316	46.1	1.356	47.5
1.277	44.8	1.317	46.2	1.357	47.6
1.278	44.8	1.318	46.2	1.358	47.6
1.279	44.8	1.319	46.3	1.359	47.7
1.280	44.9	1.320	46.3	1.360	47.7
1.281	44.9	1.321	46.3	1.361	47.7
1.282	45.0	1.322	46.4	1.362	47.8

Station ..... HELL GATE
Meter Tube # ..... Orifice 5.5″
Coeff with Machine K 14.1053

Fact Comb	Int Mult	Fact Comb	Int Mult	Fact Comb	Int Mult
1.270	17.9	1.310	18.5	1.350	19.0
1.271	17.9	1.311	18.5	1.351	19.1
1.272	17.9	1.312	18.5	1.352	19.1
1.273	18.0	1.313	18.5	1.353	19.1
1.274	18.0	1.314	18.5	1.354	19.1
1.275	18.0	1.315	18.5	1.355	19.1
1.276	18.0	1.316	18.6	1.356	19.1
1.277	18.0	1.317	18.6	1.357	19.1
1.278	18.0	1.318	18.6	1.358	19.2
1.279	18.0	1.319	18.6	1.359	19.2
1.280	18.1	1.320	18.6	1.360	19.2
1.281	18.1	1.321	18.6	1.361	19.2
1.282	18.1	1.322	18.6	1.362	19.2

* This is a sample of Con Edison's Integrator Multiplier Table, which is 9 pages long.

Several executive appointments have been made by Consumers Gas Co., Toronto. JOHN E. LEE becomes vice president and general superintendent, gas supply. With the company since 1940, Lee has been general superintendent of works since 1952. Newly named vice president and general superintendent, distribution, is W. M. KELLY. From 1952 to 1954, Kelly was assistant to the engineer of distribution. In 1954, he became general superintendent. J. C. MCCARTHY has been named vice president and general sales manager. He joined Consumers in 1949 to organize a dealer cooperative sales program. F. WARREN HURST is now vice president, treasurer, and assistant secretary. Hurst joined Consumers in 1955 as comptroller. MABEL GEARY was appointed secretary and assistant treasurer. Miss Geary joined Consumers in 1927 as a clerk.

John E. Lee
Consumers

W. M. Kelly
Consumers

JAMES A. ELKINS JR. of Houston and J. FINLEY MCRAE of Mobile have been elected to the board of directors of United Gas Corp., Shreveport.

Ohio Fuel Gas Co. has named several new home service advisors. They are: PAT WHITE in Springfield; ALICE E. GREEN in Lorain; LINDA THOMPSON in Elyria; and SHARON CHRISTY in Sandusky.

C. WESLEY MICHAELS is manager, planning and market research, for industrial electronic products, Radio Corp. of America.

JOHN L. HOLDER and WILBUR J. WHITEHILL have been appointed superintendent and assistant superintendent, respectively, of New York State Natural Gas Corp.'s Mamont district. Holder, who was assistant superintendent, succeeds the late HARRY J. MCNEELY. Whitehill is the former chief engineer of stations for the district.

ALEX C. DUCICH has been appointed assistant superintendent of gas distribution and utilization of Montana Power Co., Butte. JOHN BURLEY succeeds Ducich as superintendent of gas operations in the Butte division.

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J. C. McCarthy
Consumers

F. W. Hurst
Consumers

Mabel Geary
Consumers

William Smith
East Ohio

WILLIAM R. SMITH has joined East Ohio Gas Co., Cleveland, as assistant area development manager.

C. CHURCH MORE has been named general manager of Adams Pipe Repair Products, South El Monte, Calif.

ROBERT P. TIBOLT has been elected president and chief executive officer of Eastern Gas & Fuel Associates, Boston. He succeeds the late EUGENE H. BIRD. Tibolt has been executive vice president since 1955.

American Meter Co. has appointed HENRY H. MAYER as sales representative for the midwest sales division and ALFRED S. ERWIN as sales representative for the central sales department. Mayer will headquarter in Chicago, Erwin in Philadelphia.

CHARLES W. NIEDERAUER is northwestern regional maanger for the management consulting division of Ebasco Services Inc. He will headquarter in Portland, Ore.

ARDMORE J. HEALY has been appointed to the new post of assistant to the vice president of Lone Star Gas Co.'s Fort Worth division of distribution. Healy joined Lone Star in 1930 as a salesman. Since 1954 he has been division general sales and promotion manager.

DONALD S. DEETER, central distribution district garage superintendent for Ohio Fuel Gas Co., is now assistant superintendent of motor transport. OFG also named KENNETH F. MANN as a district engineer in the gas measurement department at Wooster.

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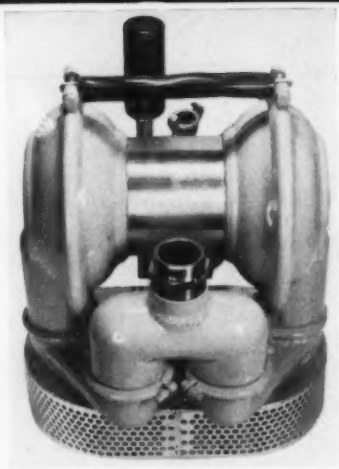

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J. W. Arnold
Parsons

J. W. ARNOLD has been named president and general manager of the Parsons Co., Newton, Iowa. Parsons is a division of Koehring Co. Before joining Parsons in April of this year, Arnold was vice president in charge of manufacturing for the Hydraulic Press Manufacturing Co., another Koehring division.

J. THEODORE KENNEDY is the new public relations director for Kansas-Nebraska Natural Gas Co., Hastings, Neb. Kennedy replaces JAMES J. DIESING, who has joined Northern Natural Gas Co.

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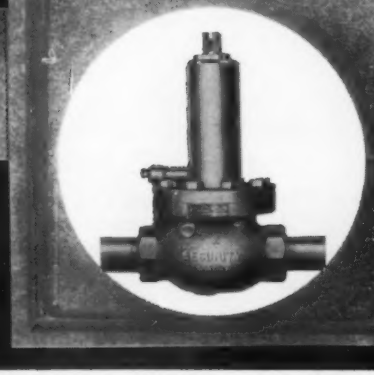

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Hellmuth Strauss
Walworth

G. A. Hoffman
Walworth

HELLMUTH STRAUSS has been appointed vice president and general sales manager of Walworth Co., New York. Strauss is returning to the company he served as an executive and board member for more than 25 years before he left in 1957. GUSTAV A. HOFFMAN has been elected vice president, sales, for Walworth. Hoffman left Walworth in 1959 after 27 years. At that time he was assistant vice president in charge of metropolitan division sales.

Neal Hall
Lone Star

NEAL HALL has been assigned to the new post of publicity and advertising director for Lone Star Gas Co., Dallas. The former advertising director joined Lone Star 11 years ago an advertising copywriter. BRUCE CUNNINGHAM has been named manager of press relations, a new post in the publicity and advertising department. He will be assisted by ALEX L. ACHESON, publicity representative, and ANNE SCHULER, publicity staff writer. Cunningham has been publicity supervisor since 1948. Other department changes include MRS. CLARIBEL THOMPSON who has been appointed supervisor of organization publicity, another newly created post. Succeeding her as editor of Lone Star's *Blue Blaze* is JOEL HORTON, formerly assistant editor.

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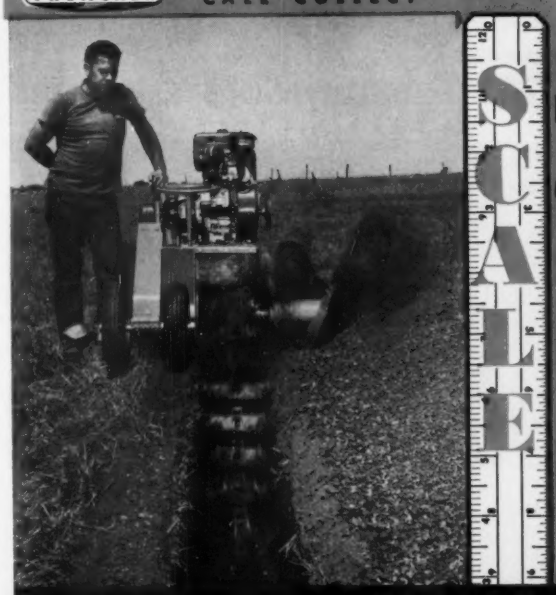

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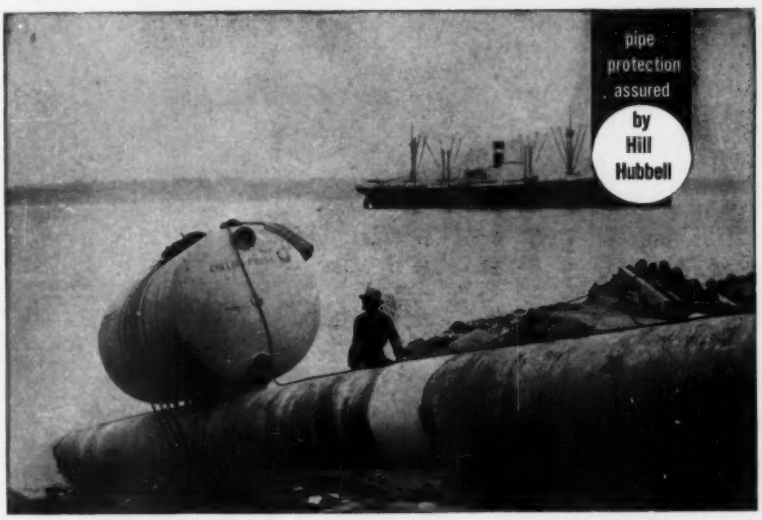

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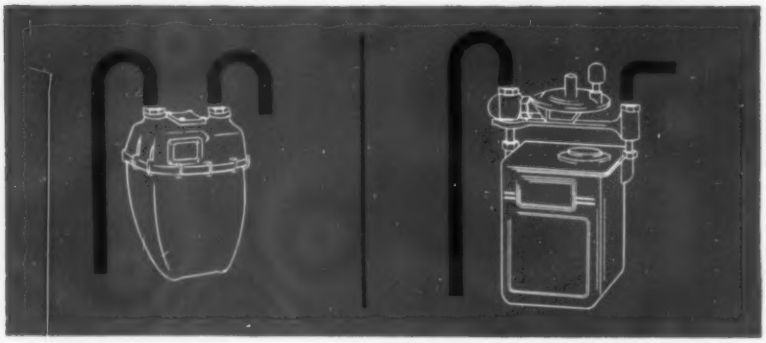

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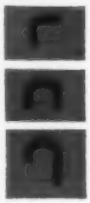

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JAMES W. TYSON II and JAMES S. EASTHAM have been elected directors of Boston (Mass.) Gas Co. Tyson is senior vice president, trustee and member of the executive committee of Eastern Gas & Fuel Associates. Eastham is vice president, secretary and general counsel of Eastern Gas.

JOHN E. TOWLE is heading a new section in the gas engineering department of Columbia Gas System Service Corp. The new section will devote its efforts to developing applications for high speed computers for system engineering and operations. Towle heads the section as senior engineer.

CLAUDE W. BROWN is a new sales and technical service representative for Grove Valve & Regulator Co., Oakland, Calif. Headquartered in Oklahoma City, Brown covers Oklahoma and Kansas.

Two transfers in the Mississippi operations of United Gas Corp. have been announced. J. WALTER DELATTE, division employee relations supervisor at Jackson, Miss., for the past nine years, was promoted to distribution manager at Biloxi. HUGH B. SNEED, employee relations supervisor in Beaumont, Texas, was named to the employee relations supervisor post in Jackson for all distribution, production, and pipeline personnel.

DR. MANDELL S. ZIEGLER has been appointed director of research and development for the Russell Reinforced Plastics Corp., Lindenhurst, N. Y.

JOHN C. CROYLES is director of customer services of the Remington Rand Univac division of Sperry Rand Corp., New York. Croyle spent the last 25 years with International Business Machines Corp. in the field of customer service.

LAWRENCE H. STANLEY has been named to the newly created post of manager of marketing services for ACF Industries Inc., New York.

DR. ANDREW DRAVNIEKS has been named scientific advisor in chemistry research at Armour Research Foundation. He comes to Armour from Standard Oil (Indiana) where he headed the corrosion section.

Minneapolis-Honeywell Regulator Co. has appointed new general managers for two of its Industrial Products Group divisions. KENNETH BRIERLEY heads the expanding activities of the Fall River, Mass., division, producer of electronic process instrumentation. JOHN H. HAGEN succeeds to Brierley's former post as head of the Rubicon division. GEORGE W. HOFFMEISTER, general superintendent of the Fall River unit since its inception in 1957, goes to the Datamatic division in Boston in a staff assignment.

DALE TEEL, executive vice president and general manager of Anchorage (Alaska) Natural Gas Corp., has been elected to the company's board. Also named was LARRY LANDRY, Anchorage businessmen and president of the Chamber of Commerce. Other board members include: ROBERT B. BALDWIN, GEOGRE L. GUDENRATH, and WILLIAM C. SMITH JR., all of Houston; FRANK CHILSON, Los Angeles; and JACK BARRETT, WALTER J. HICKET, DR. ASA L. MARTIN, PAUL F. ROBISON, K. A. SHEPPARD, and ALBERT C. SWALLING, all of Anchorage.

ROBERT P. LEWIS has been named manager of Whirlpool Corp.'s newly formed distributor development department. Another new department, customer assurance, is headed by CHARLES C. WOOD.

J. P. KNOPF, secretary-treasurer, has been elected a vice president of Tube Turns Plastics Inc., Louisville, Ky.

DALE N. JOHNSON is a new sales and service representative in Houston for Grove Valve & Regulator Co., Oakland, Calif.

LEWIS I. TERRY is laboratory manager of Dearborn Chemical Co., Chicago . . . Caloric Appliance Corp.'s new coordinator of advertising and promotion in the southeastern division is PHILIP SHEEHAN . . . CHARLES B. LEBER has succeeded BURT M. POWELL as advertising manager of Caterpillar Tractor Co. FRANK S. FOSTER replaces Leber as manager of the sales division of the defense products department.

Continued on page 137

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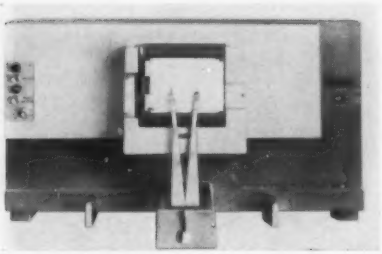
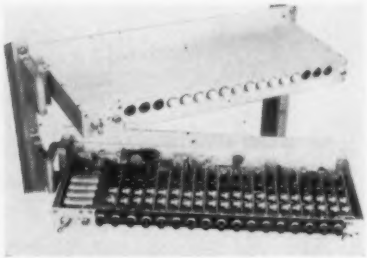
New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 121, 122



1. Chart integrator

American's chart integrator is for use with strip charts and conventional instrument round charts (GEC-750). Three values from a single run are provided. It computes chart extension for differential and static pressure and provides read-out values for average absolute static pressure and average differential pressure.
American Meter Co.



3. Fault Finder

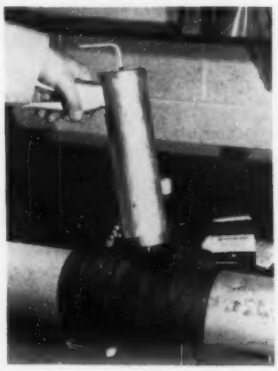
Collins has a new fault alarm for microwave systems (GEC-140). It reports 11 or 17 different fault conditions from as many as 30 remote stations. A transmitter at each remote station scans for faults and simultaneously reports all present to a supervisory station every four seconds by means of a single AM tone.
Collins Radio Co.

5. Measuring thickness

A transistorized instrument measures wall thickness between .025 and 2.50 in. (GEC-540). Readings are made by placing a transducer on the surface to be measured, and turning a dial. The battery-operated, ultrasonic unit, Zonizon SO-300, can detect corrosion or wear in tanks or pipelines with an accuracy of ±1 per cent.
Magnaflux Corp.

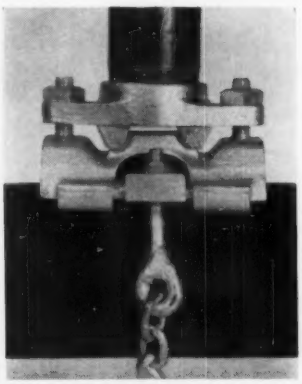
2. Crawler-trencher

The new Ditch Witch crawler-mounted trencher series is especially useful where traction or flotation is marginal (GEC-210). Completely self-propelled, the trencher is equipped with a steering device that takes all of the muscle out of maneuverability.
Charles Machine Works



4. Pipe repair

A safe, reliable means of repairing gas lines without the use of open flame and without entirely removing the line from service has been developed (GEC-500). The thermo-setting epoxy resin repair system works on pipe operating at pressures up to 100 psi.
Minnesota Mining & Mfg. Co.



6. Pipe saddle

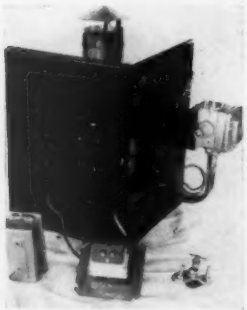
The "chain-tong" principle is used in Aitken's new pipe saddle (GEC-370). The Universal leveling saddle fits pipe sizes from 1½ in. to 16 in. The chain wraps around the pipe and is easily and quickly tightened with a single bolt at one side of the saddle.
M. N. Aitken Co.

7. Gas meter

A new line of gas meters is announced by Arkla Meters (GEC-560). First in production is the Arkla V-250, a 250 cfh domestic meter. V-shaped design allows index to be included in boundaries of the meter housing. The shape also provides easy access for adjustments and permits simplification of measuring mechanism.
Arkla Meter Division

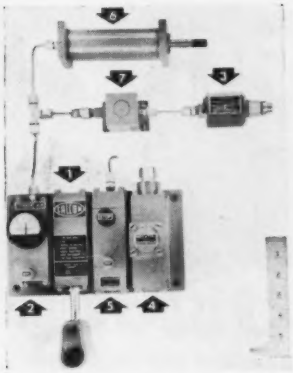
8. Computer system

Libratrol-1000 is an advanced process control digital computer system capable of accepting data directly from analog instrumentation (GEC-180). It also provides for closed-loop operation. Included are an advanced memory unit, new developments in read-and-write head design, and a built-in voltage-to-digital converter.
Librascope Division



9. Humidifier

Southern Manufacturing is producing a gas-fired humidifier (GEC-420). The Velair humidifier, completely automatic, can be installed on any forced air heating system. Featured are stainless steel vaporizing chamber, safety pilot, low voltage wiring, fan interlocking, hermetic float control, humidistat, and limit control.
Southern Mfg. Engineers



10. Engine safety control

A new engine safety control system protects all types of engine installations against dangerous overspeed, temperature, and pressure conditions (GEC-200). The Calcon system, non-electric and self-powered, puts into operation almost any type of pilot operated valve, switch, etc., when its captive air charge is released.
California Controls Co.

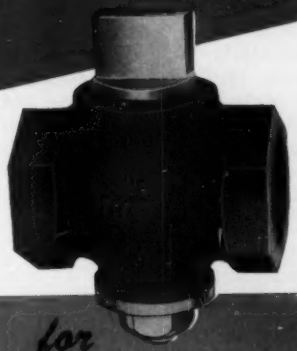
11. All-fuel chimney

AmeriVent's new all-fuel chimney can be used in a wide variety of applications (GEC-840). Among these are heaters or furnaces, domestic incinerators, bakery ovens, lead-melting ovens, rendering furnaces, low pressure steam boilers, and many others. The packaged chimney is light, rugged, versatile, and easy to install.
AmeriVent Inc.

12. Gas detector

Detectogas air density monitor detects presence of gas by the balance-float principle (GEC-465). It works around the clock without power or an attendant. Explosion-proof switches activate any type of alarm system when there is a change in air density. It automatically compensates for changes in temperature, humidity, and atmospheric pressure.
Detectogas Instruments Inc.

HAYS
Iron Body
Brass Plug
Gas Stops



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With or Less Check Pin
•
Lock Wing

for
INDUSTRIAL USE
with Square Head

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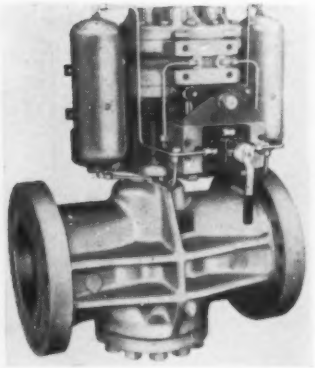
TAMPER PROOF
and
LUBRICATED PATTERNS

GENERAL PRODUCTS DIVISION
HAYS MFG. CO.
ERIE, PA.



13. Valve operator

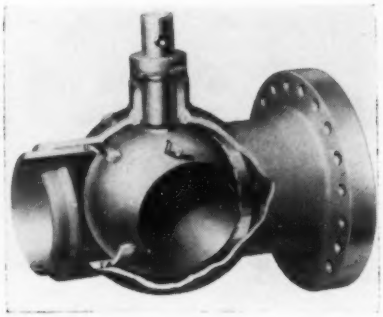
A new "G" series Limitorque valve operator is mainly for use on rotary plug valves of any size, particularly those in gas pipeline service (GEC-200). Operator uses gas pressure from pipeline and is easily mounted in any position. It requires no external gearing, and is readily adaptable for field mounting.
Philadelphia Gear Corp.

14. Pipe coating

Dearclad 765 is a new epoxy pipe coating with a rapid curing rate, plus high resistance to physical impact, abrasion, and moisture adsorption (GEC-130). Recommended for yard use because of its ease of application, short curing time, and sag resistance at elevated temperatures. Its two components are blended at point of use.
Dearborn Chemical Co.

15. Chart averager

UGC's chart averager continuously averages temperature, gravity, or pressure charts (GEC-750). One operator handles the entire job, without comptometers or adding machines. It's all done in one operation, without need for checking. Records show the chart averager is many times as fast, and much more accurate than the older manual systems.
UGC Instruments

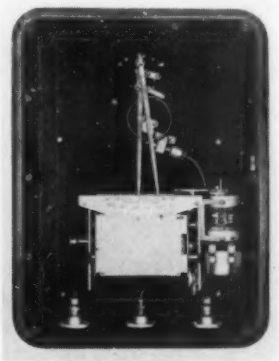


16. Ball valve

Cameron's new ball valve uses the principle of rotating seats (GEC-820). It has neither bonnets, gaskets nor joints, and doesn't need lubrication to seal bubble-tight. Compact and light weight, the valve—even in sizes up to 36 in.—may be installed in the most convenient position without regard to top or bottom.
Cameron Iron Works

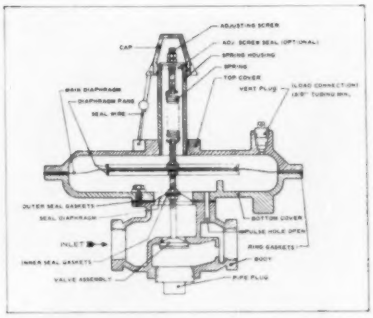
17. Pipe seal

Margate's Marseal pipe and joint sealing compound is available in a plastic squeeze bottle (GEC-730). The bottles have cone-shaped nozzle designed for the swift prepration of hard-to-get-at spots. Unbreakable and easily refilled, the bottles are adaptable to both large and small jobs. The 2-oz. bottles are available singly or in lots of 6 and 12.
Margate Manufacturing Co.



18. Strip chart recorder

Records of flow, pressure, and temperature for periods up to 36 days are provided by a new 38-ft strip chart recorder (GEC-750). Of the cartridge type, the instrument makes possible reduced chart-changing costs. Chart speeds are from ½ in. to 6 in. per hour. It is powered by an electric drive or a Gasclok power drive.
American Meter Co.

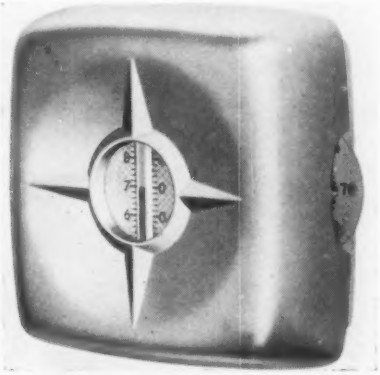


19. Zero regulator

A velocity baffle and a sensitive diaphragm are keys to the accurate functioning of a new zero regulator (GEC-700). It automatically holds constant outlet pressure to within ±0.1 in. w.c. at all flow rates. At increased capacities, the baffle prevents the usual drop in outlet pressures encountered with zero regulators.
Bryant Industrial Products

20. Control panels

Technically made control panels, custom fabricated, are available from I & C Inc. (GEC-090). Control panels for use in varied instrumentation and automatic control systems are made to client's specifications. Precision equipment holds panels to tolerances of 1/32 in. Any necessary adjustments are made at the I & C plant, not on the job.
I & C Inc.



21. Room thermostat

Accurate temperature response is achieved in Signet's T700 room thermostat by a precision-made bimetal element (GEC-190). In developing the T700, particular attention was paid to ease of installation. Snap-acting contacts are so positioned within the thermostat that dust and lint will not settle on contacting surfaces.
Signet Controls

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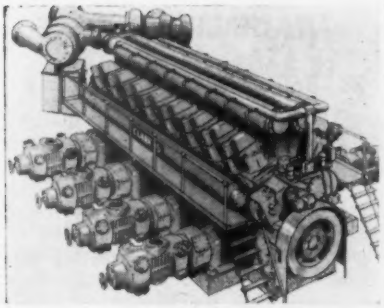


22. Gas engine compressor

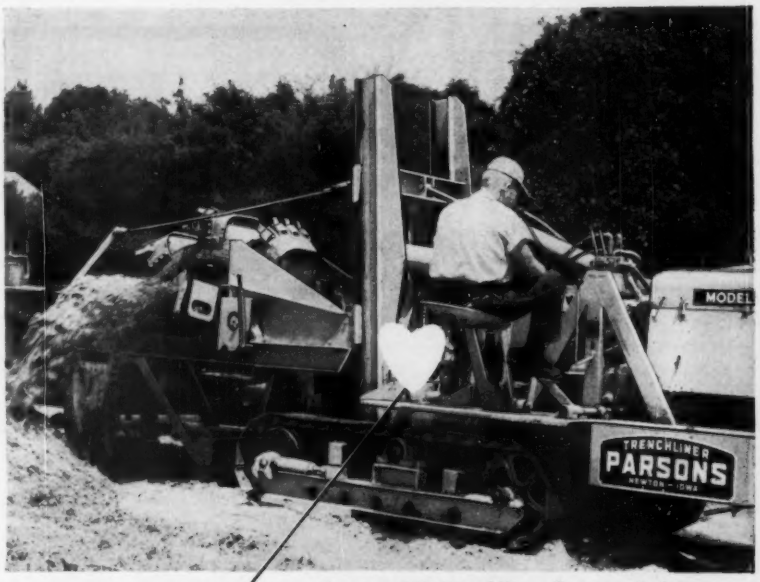
Clark Bros. has introduced a high hp, V-type gas engine-driven compressor with compressor cylinders on one or both sides of the crankcase (GEC-160). This turbocharged, 2-cycle machine will be the world's largest gas engine-driven unit. Model TCV is built in 12- and 16-power cylinder models rated at 4000 and 5500 bhp.
Clark Bros. Co.

23. Microwave building

A new type of pre-built building has been designed specifically to house microwave equipment (GEC-060). Wiring and insulation can be installed prior to shipment. Field installation takes minutes instead of days. Such problems as ventilation, tightness, and door seals have been solved with the new building, it is claimed.
Tower Construction Co.

24. Compact trencher

Auburn's compact trencher is a "big" self-propelled trencher in a small package (GEC-210). Single unit body is constructed of heavy steel plate. Because of its transport wheels, which raise and lower hydraulically, and a retractable drawbar, the trencher can be towed by any vehicle. It digs up to 500 ft per hour.
Auburn Machine Works



Parsons 130 Trenchliner digs trench from 12 to 24 inches wide — depths to 5¾ feet.

The heart of 130 Trenchliner is GUARANTEED FOR LIFE

The head-shaft, heart of the trencher, gives and takes about all there is in ditching service. *Parsons guarantees their 130 head-shaft for a lifetime of service!* Here's why:

Head-shaft assembly starts with special alloy shafting stock — extra large, of course! It is treated and hardened to stand the rugged digging gaff, rides on heavy-duty antifriction bearings. Last, but no less important — drive sprockets are *bolted* to a shaft sleeve to protect the shaft and absorb torsional strains and loading shocks.

This is but one of the reasons for the 130's popularity in gas line service. Your Parsons distributor can give you many more. See him soon.

P19

PARSONS HEAVY DUTY

PARSONS COMPANY
NEWTON, IOWA

A Division of KOEHRING Company

25. Check valve

Crane's new 125-lb bronze vertical check valve replaces the No. 24 series (GEC-820). Changes in the No. 29 include one-piece construction of valve body, use of hexagon ends, smaller reduced ports, and a new type of guided disc. Size range: ¼- to 3-in.
Crane Co.

27. Room thermostat

The D'LUXline room thermostat from White Rodgers is offered in heating, cooling, and heating-cooling types (GEC-190). Featured is the Level-Bubble built into the wall-mounting plate. The company says this assures a perfectly level mounting for exact calibration.
White-Rodgers Co.

26. Two-way radio

General Electric has designed a new space-saving table model two-way radio (GEC-140). The equipment may be used to talk to in-plant vehicles, cars or trucks on the road, shoulder-strap portables, or shirt-pocket radios on the same frequency.
General Electric Co.

TRADE LITERATURE

28. Ball valves

The rotating seal principle of Cameron's ball valves is discussed in a new catalog (GEC-820). Each operation of the valve partially rotates the seat to change the relation of the mating surfaces and to provide a continuous reseating action.
Cameron Iron Works

29. Safety valves

Protectrol Model P and Model E valves are described in catalog sheets from Butte Brass (GEC-820). Model E is an electric safety gas valve while Model P is an automatic shutoff, manual reset gas safety valve.
Butte Brass & Controls Co.

30. Dry scrubbers

A 4-page folder describes Peerless' new line of dry scrubbers (GEC-720). Centrifugal force is used to separate solid and liquid particles from gas. Diagrams and capacity formula are included in Bulletin 7-50.
Peerless Manufacturing Co.

use-proved perf-a-seal epoxy cuts costs of corrosion and leak control

formulated specifically for the gas industry

This actual-use photo shows how quickly and economically leaking bell-and-spigot joints can be sealed with PERF-A-SEAL, strongest sealant yet. Cuts clamping costs as much as sixty percent. Formulated specifically for the gas industry, this reinforced, quick-curing epoxy compound is recommended by leading gas utilities because PERF-A-SEAL combines tremendous adhesive strength with high impact strength, also the necessary degree of flexibility required to compensate for pipe motion. Pipe patches also exhibit high bursting strength and maximum chemical and corrosion resistance.

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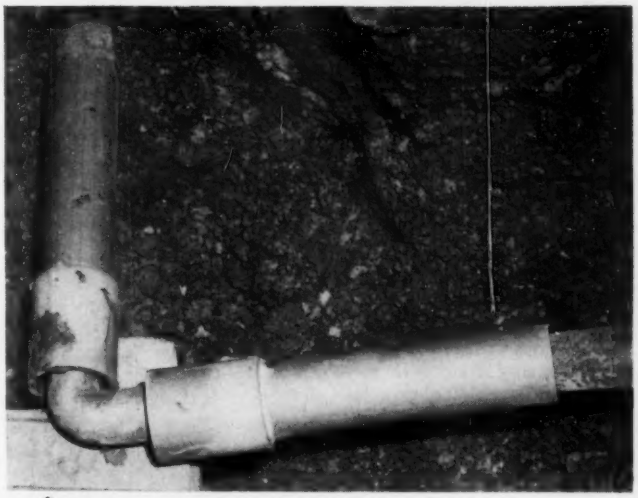
safe, sure renewal service with money-saving perfex materials

These photos show plastic pipe and other materials in actual installations of a major gas distribution company. All are products of Perfex Plastics, specialists with long experience in the renewal service field. Each product is held to specifications, precision-engineered with close tolerances—your guarantee of safe, sure service. For example:

PIPE and COUPLINGS

Here a new section of 1.375 in. plastic pipe is being inserted into old 1.50 in. steel service. This renewal service is available for 1"—1¼"—1½" and 2" I.P.S. gas service. Inside couplings plus thinner and cement are also available for joining all types of pipe. ⬇

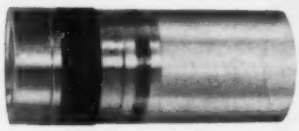


⬆ ***PROTECTOR SLEEVE***

Designed for maximum protection at the main where plastic pipe is inserted into old metal service. Scientifically engineered to assure safe, sure, long-lasting renewal life.

HEAD ADAPTER ➡

The strong link between metal and plastic service, patented by Perfex Plastics for economical, gas-tight headache-proof tie-in of the old and the new service. All parts of this head adapter are non-corrosive.



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Supplier to America's Leading Gas Distribution Companies

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31. Needle valves

American's Bulletin 420 describes its forged steel needle valves and fittings for heavy duty service to 5000 psi (GEC-820). Used for many gas measurement and control jobs, the needle valves and fittings are available in forged carbon steel and forged stainless steel.
American Meter Co.

32. Small message receiver

G-E's Voice Director pocket radio message receiver is described in Bulletin ECR 747 (GEC-140). A dispatcher or secretary using two-way radio equipment can transmit voice directions to personnel equipped with the receiver unit.
General Electric Co.

33. Gas burners

Two types of precision-jet gas burners are described in a 6-page bulletin from Barber (GEC-080). Included are Btu specifications and physical dimensions of 24 models of the impinged jet type and 24 models of the slotted cap jet design.
Barber Manufacturing Co.

34. Marketing and promotion

A marketing and promotion portfolio describes consumer advertising, point-of-purchase advertising, and person-to-person promotion available from Gas Advertising Services (GEC-550).
Gas Advertising Services Inc.

35. Automatic control

Honeywell has revised its loose-leaf "Catalog of Automatic Controls for Heating and Cooling" (GEC-190). The latest revisions bring the catalog, first introduced last July, right up to date.
Minneapolis-Honeywell

36. Industrial equipment

A 24-page, full-color catalog shows the entire new industrial equipment line of Massey-Ferguson (GEC-210). Action photos, cutaway drawings, and operating information are presented.
Massey-Ferguson Industrial Div.

37. Thermoplastic valves

"Ball Valves for Corrosive Service" is a new bulletin describing top-entry, top-adjusting thermoplastic ball valves made of UPVC (GEC-820). The new line's corrosion-resistance characteristics are described.
Tube Turns Plastics Inc.

38. Combustion safeguards

Selas Corp.'s improved line of automatic Firechecks and a new design safety blowout are covered in Bulletin CS-2 (GEC-190). Included are drawings, dimension data, piping diagrams, and principles of operation.
Selas Corp. of America

39. Gas industry film

Fisher Governor has produced a sound-color movie illustrating the emergence and growth of the gas industry (GEC-450). "Napoleon's Gun Barrels" is a 16-mm film with a running time of 28 minutes.
Fisher Governor Co.

40. Air conditioning

A new filmstrip tells the product and sales story of Bryant gas air conditioning units (GEC-020). The filmstrip, with a coordinated record, offers a 20-minute training program for use at regional and local levels.
Bryant Manufacturing Co.

NEW GAS-FIRED, PORTABLE BRAZIER!

MADE BY THE MAKERS OF FAMOUS CHARMGLOW GAS LAMPS!

See it at Booth P5 at the

AGA "FESTIVAL OF FLAME" Oct. 9-12, 1960

LOOK AT THESE FEATURES!

- Heavy Gauge Steel Body
- Wind Hood (Optional)
- Rotisserie (Optional)
- Cast Aluminum Polished Cooking Grill
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- Lifetime Char-Rock
- Lifetime Burner
- Aluminum Legs
- Simple Plug-In Connection
- Lower Shelf
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- Unit Completely Weather Proofed
- Large Cooking Area and other fine features

MODERN HOME PRODUCTS

RUSSELL, ILLINOIS **ANTIOCH 1272**

GAS DISTRIBUTION NEWS

All roads lead to Atlantic City

As we went to press in mid-September, registrations were pouring in for AGA's annual convention in Atlantic City (Oct. 9-12). Delegates were not dawdling. Over 235 companies had already increased their PREregistration (copyrighted, Jac Cushman) delegates to Baghdad-on-the-Boardwalk over those of two years ago. "Festival of Flame" seems to be drawing on a par with the Miss America contest.

One gas company registered 122 delegates. The president of another company plans to register 150 people instead of his usual 120. More middle management than ever before are being sent to this year's convention.

'Referee' awards domestic gas consumers a round

One round of a semi-final event before FPC—billed as a Residential vs. Industrial gas sales "go"—has been chalked up to domestic gas users.

The question: Can an interstate gas pipeline ignore home and commercial consumers to arbitrarily sell natural gas to more profitable industrial customers? Presiding Examiner Francis L. Hall said "no" with more than passing emphasis. The decision was against Mississippi River Fuel Corp. in favor of likable little Red Bud, Ill.

Hall reminded Mississippi River Fuel that it is the usual practice in industrial contracts to provide for interruptible service so the needs of homes and commercial consumers can be filled. In the battle at hand, he said that MRF had in effect assured its industrial customers of ample gas at all times, whether or not "the public interest" and "adequate service to existing customers" suffers. FPC will rule on this decision soon.

California treats advertising sales promotion

An application for a rate increase on the part of SoCal and So-Counties Gas companies brought on a PUC "study" of the distributors' relationships with appliance sales people and sales promotion.

The PUC didn't like the gas companies working up prime appliance prospects' lists for limited distribution. They did say such an effort to sell our industry's utilization equipment was all right if all appliance dealers within their service areas were handed copies. They also asked for a halt in the practice of the Southern California companies selling certain appliances direct to volume builders, large apartment project builders, etc.

Could it be that the Southern California gas companies were looking too good with their dynamic advertising-sales promotion efforts for the peace of mind of the opposition?

New Arkla division

Following the merger of Consolidated Gas Utilities Corp. into Arkansas Louisiana Gas Co. on Aug. 31, R. W. Camp of Oklahoma City, former president of Consolidated, was named division manager of a new Oklahoma-Kansas division of Arkla.

C. B. Day, of the same city, former vice president of the merged company, was named superintendent of the new division. About 90,000 customers in 51 Oklahoma and Kansas communities will be served by the new Arkla unit.

ConEdison offers money-back heat deal

Owners of one- and two-family homes in its territory are offered a chance to try gas heat under a money-back "Certified Cost Home Heating Plan" by Consolidated Edison Co. of New York.

The company certifies that the cost of gas heating during the first year will not exceed the gas company's estimate by more than 10 per cent. If it does, ConEdison will remove the gas heating equipment, on request, and refund the customer the cost of both equipment and installation.

A big "Certified Cost" advertising program is planned by the Manhattan gas distributor and will carry information about the advantages of gas heat. Most important media will be hit by the campaign from September until mid-December.

21 Standards 'approved'

Revisions and additions to 21 gas appliance approval and accessory listing standards have been approved as American Standards by the American Standards Association. They go into effect Jan. 1, 1961.

In the domestic appliance area, the revised provisions deal with gas-fired air conditioning units of the absorption type, boilers, vented recessed heaters, room heaters, incinerators, clothes dryers, domestic ranges (both free-standing and built-ins), refrigerators, duct furnaces, unit heaters, and water heaters.

For commercial applications: revised standards are available for hotel and restaurant ranges, portable baking and roasting ovens, deep fat fryers, and gas-fired counter appliances.

Approved revisions to standards in the accessory field are: manually operated gas valves, metal connectors for gas appliances, and domestic conversion burners.

Printed copies will be available near year's end. For more information, write AGA Laboratories, 1032 E. 62nd St., Cleveland 3, Ohio.

California rules on ad spending

CALIFORNIA'S PUC authorized rate increases for Southern California and Southern Counties Gas companies. Part of the increases offsets a hike in the price of out-of-state-gas put into effect late in August by El Paso Natural Gas Co.

The commission estimates that the companies will each earn a 6.6 per cent rate of return with the new rates.

SoCal wanted a boost that would add about 80 cents per month to the average householder's gas bill. It got 57 cents. SoCounties $1 a month hike was reduced to 65 cents. Overall, the PUC reduced SoCal's request by 27 per cent and SoCounties' by 25 per cent.

Also settled by the decision was the commission's position on expenditures for advertising and sales promotion. The commission did not limit the amount which either firm may spend on advertising, but for rate making-purposes allowed as a chargeable expense to be paid by customers, less than the applicants had estimated would be needed.

In this regard, the commission pointed out:

1. It has always recognized the competitive need for advertising by utilities, even though customers often have protested that no advertising is necessary;

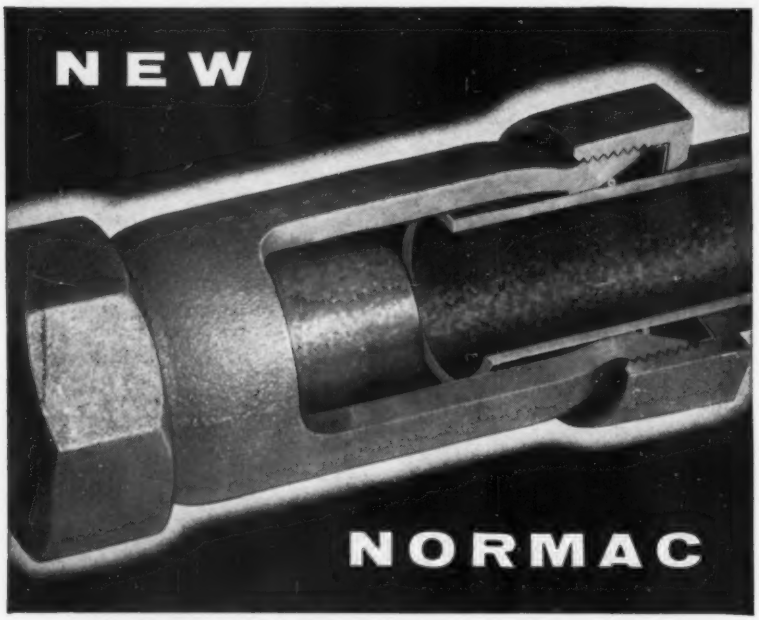
2. It does not limit the amount a utility may spend on advertising, but fixes as the amount of such advertising to be included as an expense of operation and paid for by ratepayers, the amount it believes to be reasonable;

3. It has, in the past, raised the amount to be spent for advertising by a regulated company when that was believed to be in the public interest.

The commission said that its uniform system of accounts for utility accounting sets forth several sales promotion expense accountings including advertising. "Therefore, it should be clearly understood that sales promotion expenses, including advertising, may be legitimate allowable expenses of a public utility. The issue . . . is whether applicant has sustained its burden of proof as to the reasonableness of the amount to be borne by the ratepayer."

"Advertising by public utilities frequently has been opposed by customer witnesses in rate proceedings. But, the commission always has recognized the value of advertising and sales promotion by utilities. . . . It might further be pointed out that the commission has, on at least four occasions, considered that ratepayers would benefit if the company spent additional money on advertising. In these instances bus companies were ordered to expand their advertising and promotional activities beyond the amounts they had estimated were necessary, and additional funds were allowed in rate making for attempts to bolster patronage."

For SoCounties, the commission found $3.15 million to be a reasonable amount for sales promotion in the test year of 1961, to be borne by ratepayers. Although SoCounties had made no firm commitments for advertising and promotion funds in the test year, it estimated spending $3.26 million, some $117,000 more than the commission allowed for rate making purposes. The commission staff



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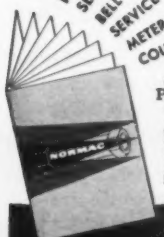

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estimate was $867,000 below that of the company.

The commission included $6.5 million for SoCal, which had estimated 1961 expenditures at $6.79 million. The commission staff figured $5.14 million would be enough.

The commission said "Our action . . . is not to be construed as limiting the amount applicant may spend for sales promotion in the test year or any other period. Such determination is for the applicant to make. Our determination relates solely to the reasonable allowance of sales promotion expenses to be borne by the ratepayers."

City-owned systems keep growing

There's been no let-up in the growth of city-owned gas utility systems.

Latest U. S. Census Bureau figures show municipal gas system revenues hit a new high of $142 million in 1959. This compares with $134 million the previous year; $114 million in 1957, and more than doubles the $68 million recorded in 1955.

At the same time, government expenditures for these systems are also increasing. Spending hit $122 million last year, up from $106 million in 1958 and $88 million in 1955.

Of the 1959 expenditures, $98 million went for current operation, $20 million for capital outlays, and about $3 million for interest on some $94 million in long-term debt.

The figures climb higher when gas supply systems owned by counties, states, and independent tax districts are added to city totals. Total revenue of all governmental-owned gas supply systems in 1959 reached $190 million; expenditures hit $170 million.

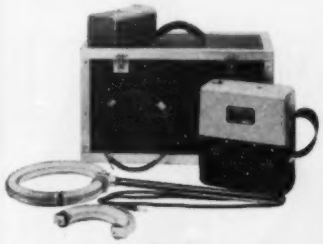
Gas Service builds Kansas City office

Gas Service Co. will have a new building for its Kansas City, Kan. division. The $200,000, 14,000-sq ft structure is slated for completion next April.

A section of the roof will be used for air conditioning and heating equipment, housed in a penthouse. The penthouse will be ringed with planters and sheltered by a canopy. The area also will be used for display of outdoor gas equipment.

FOUR WAYS TO INSURE GOOD COATING PROTECTION

Continuity is all important in a protective coating. Whether it's a 90 mil coating on a pipeline or a 3 mil coating on a chemical tank, a tiny pinhole can lead to the destruction of the coating. Use of a Tinker and Rasor Holiday Detector will quickly locate pinholes as well as weak spots caused by air bubbles, coke, rust or scale. Minutes spent inspecting with a Tinker and Rasor Holiday Detector while the job is open can save days of down time later on.



Pipeline Detectors

E-P For damp or dry surface, high electrical resistance coatings. Output adjustable from 8000 to 20,000 pulsating voltage. Electrodes available: half circle, spring for pipe to 6", full circle to 30" silicone brush for flat surfaces.

E-4 This lower cost type of detector is specifically designed for smaller diameter pipe and flat surfaces with dry surface, high electrical resistance coatings. Output adjustable from 8000 to 20,000 D.C. voltage.

Thin Film Detector

M-1 For painted or sprayed thin film coatings. Maximum applied voltage 67½ V., non-destructive to coatings. Belt mounted, 4 lbs. total wt.

Underground Pipeline Detector

P-D For detecting holidays, electrical contacts or locating the pipeline itself, **without uncovering the pipeline.** Completely transistorized — long life and light weight.

Engineering Note:

Every protective coating specification should include TR Holiday Detector inspection. Write for specification guide.

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Smog amendment protested in L.A.

Still hanging fire is the proposed amendment to Los Angeles County's smog abatement Rule 62.

Under the present rule, large industry must burn gas instead of oil for the six months of the year when atmospheric conditions presumably magnify the annoyance of air pollution.

The amendment, proposed by the Western Oil & Gas Association, would permit oil burning the year-round—subject to suspension when adverse atmospheric conditions prevail.

In response, Southern California and Southern Counties Gas companies told the L.A. County Board of Supervisors that they are not able to give the "on-again, off-again" industrial gas service proposed by WOGA.

"The economics of our business do not require 100 per cent gas usage in the summer months as at present," the statement said. "But neither can they absorb severe daily fluctuations in the use of gas in the summer by large volume customers who may want zero gas on one day and 100 per cent service on another."

The preliminary hearing on the amendment was continued until November 29, when SoCounties president Guy W. Wadsworth Jr. will give the Pacific Lighting companies' point of view.

Actually, the majority of the Board of Supervisors indicated that the amendments were unconstitutional and could not provide the basis for a formal hearing. The continuance of the preliminary hearing was voted only on condition that WOGA representatives meet with the county counsel and the air pollution control officer to attempt to work out revised amendments that might meet objections raised.

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No profits for Idaho firm until 1962

Idaho's Public Utilities Commission gave Intermountain Gas Co. a 10 per cent overall rate increase. The company, however, won't realize any net profit until 1962.

Included in the boost is an interim hike of 7.6 per cent granted in February. Intermountain had asked for a 25 per cent increase, claiming such an increase would have permitted it to make a profit this year.

Commissioner Ralph Wickberg said the PUC action would give Intermountain about $200,000 a year in additional revenue.

The commission recognized the importance of natural gas in "future industrial growth and development" of the area. But, it said, Intermountain "cannot be guaranteed a profit in its development stage . . . Rates must be set at a level that a profit may be earned with prudent management when the development period is over."

Intermountain began its construction program late in 1956, and is now serving about 20,000 customers. It has franchises in 41 southern Idaho communities.

PUC said the record shows the company was operating at a loss prior to the interim increase granted in February. To continue operating at such a loss "would have resulted in irreparable damage to its financial condition."

Wickberg said Intermountain should have its first profitable year in 1962.

Meter production started by Arkla

In line with its program to expand and improve its family of gas utilization and distribution products, Arkla Air Conditioning Corp. is producing a line of natural gas meters.

Edward R. Gilmore shows the unique V-shape of the new gas meter. The V-shape allows the index to be included within the boundaries of the meter.

The first meter developed by Arkla Meter division is slated for production this fall in a new $2 million plant in Russellville, Ark.

Edward R. Gilmore, authority in gas measurement and control design, is director of the new division.

First production model is the 250-cu ft per hr Model V-250. Two other domestic models are in preliminary stages or development. Commercial and industrial meters will complete the line.

New hearings granted

Idaho's PUC was slated to hear applications of Citizens Utilities Co. and Shoshone Natural Gas Co. to provide natural gas service in Shoshone county.

The commission denied both applications after hearings in 1957. Early this year, however, the state supreme court ordered further hearings.

COME IN AND SEE

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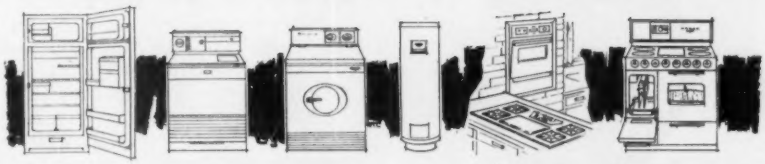
THE COMPLETE



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GAS KITCHEN AND LAUNDRY APPLIANCES

AGA CONVENTION, 1960

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BOOTHS F-1 and F-2
Convention Hall
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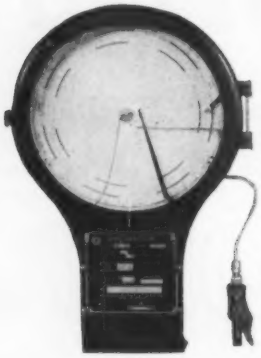
NORGE B-W BORG-WARNER

How these gauges guard your demand metered services

Many gas utilities have established penalty rates for gas used during peak periods. Accurate records are needed to prove these demands—also to show areas where excessive usage is causing pressure deficiencies.

The two Rockwell gauges pictured below provide inked records which verify use and furnish both volume and pressure data. For additional information write: Rockwell Manufacturing Company, Dept. 60-G Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Box 420, Guelph, Ont.



ROCKWELL TYPE "T" EMCORECTOR—chart is clock driven. One pen traces an accurate record of pressure against time. A second pen records volume in units of either 1,000 or 10,000 cu ft. Two straight reading indexes are provided—one for actual displaced measurement while the other automatically corrects this to base pressure volume.

ROCKWELL COMBINED RECORD GAUGE. Has clock driven chart on which two pens trace (1) gas usage in units of either 1,000 or 10,000 cu ft and (2) gas pressures. These increments can be calculated, if desired, to correct to base pressure volume.

VOLUME AND PRESSURE GAUGES

another fine product by

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Gas used in CF&I blast furnaces

The use of natural gas in blast furnaces has been under development at the Pueblo (Colo.) plant of CF&I Corp. for nearly two years. One furnace has been operated continually with gas injection for more than a year, according to John M. Negomir, practiceman in the Blast Furnace department at the Pueblo plant. He was addressing the 1960 convention of the Association of Iron & Steel Engineers.

Negomir pointed out that construction now underway will make it possible to use natural gas as part of the regular operation on all four of the Pueblo furnaces.

The first actual injection of natural gas into a furnace was made in November 1958. By June 1959 a complete supply and control system was put into service. This system has been in constant use since installation. Natural gas has been injected into the blowstocks or blowpipes. This method has proved to be satisfactory for furnace operation, but the blowpipes must be protected against extremely high temperatures. Injection through specially constructed tuyeres is now being tested.

A convincing coke saving was obtained in July 1959. Since then, a coke rate reduction of 75 lb per 1000 scf of gas has been realized over extended periods of time. Blast temperature is very critical to furnace performance, and has limited gas usage to 5 per cent of the wind volume.

The relative costs of coke and natural gas have justified the immediate installation and use of natural gas injection as part of the regular blast furnace operation.

Canadian mine burning gas

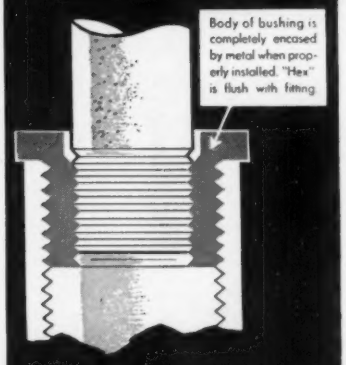
Falconbridge Nickel Mines Ltd. has started using natural gas supplied by Northern Ontario Natural Gas Co. Ltd.

Northern Ontario built a 6.5-mile, 6-in. line to supply an initial 2 MMcfd to fire two boilers, each with a capacity of 25,000 lb of steam per hour, and five sintering machines used in the smelting process.

The contract between Falconbridge and NONG provides for additional quantities of gas at a later date.

MAYCO

NYLON DIELECTRIC BUSHINGS



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■ Sandwiched between two dissimilar metals, Mayco nylon dielectric bushings prevent metal to metal contact – stop *electrolytic* action!

Able to withstand pressures in excess of 1000 lbs. and temperatures over 300°F, Mayco dielectric bushings gain added strength from clamping action of surrounding metal.

Most sizes also available with extra-heavy "Hex" to facilitate use of ordinary wrench.

Couplings and unions also available factory equipped with Mayco bushings.

Order Mayco Dielectric Bushings from your jobber or write to:

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Manufacturers of: MAYCO dielectric fittings and MAYCO water softeners and filters

Supervisors go to school during slack time

More than 500 partially idled employees at Lone Star Steel Co. went back to school recently. Attending the three-week classroom training program were those supervisors and administrative people whose jobs had been curtailed because of production slowdown which resulted in layoffs of 1500 hourly wage employees.

The classrooms were set up inside the Lone Star Steel plant in Morris county, Texas. Lecturers were from Southern Methodist University and Texas A&M College as well as leaders in business, agriculture, and the petroleum industry.

As one company spokesman put it, "Our employees can see that we are not selling the pipe we produce, but very few of them have been introduced to the economic situation causing the problem."

Lectures on basic modern economics were followed by sessions on human relations and communications.

The economics section featured such topics as Progress and Economics, Distribution of Income Among Individuals, Prosperity vs. Recession, Organizing and Financing Business, and the U. S. in World Economy.

The SMU program also featured a special course in public speaking. Enrollment was limited to about 30 employees who had been selected to participate in Lone Star's new Speakers' Bureau.

Across-the-board increase for PG&E

California's PUC awarded Pacific Gas & Electric Co. an across-the-board rate increase of 1.864 cents per Mcf of gas. This will give PG&E's gas department a 5.9 per cent rate of return, provided it switches to depreciating properties at an accelerated rate for tax purposes.

PG&E said the switch would mean lower tax expenses and an increased return on investment for the gas department. It asked the California commission to help it work out an accelerated depreciation plan.

The increase is expected to provide a total of $9.81 million in new revenues in 1961, offsetting the increase put into effect by El Paso Natural Gas Co., PG&E supplier.

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DOES IT IN ONE OPERATION . . .

Bores Hole, Installs Casing at the Same Time . . .

Here 106' of 24" diameter casing is being installed under a railroad bed as 18 hp air-powered Ka-Mo drill bores hole ahead through compacted clay and ballast. Drilling Time: 4 hours.

Line work that crosses highway, byway and city streets calls for Ka-Mo. With a Ka-Mo drill you can install casing as you bore without fear of costly cave-ins . . . without stopping traffic or cracking pavement . . . no back filling or re-surfacing.

Your Ka-Mo drilling specialist can recommend the right drill for you. He knows his field . . . has helped many cut costs and speed line installation work. Ka-Mo drills available in 2" to 48" sizes, and larger. Powered by air, hydraulic, electric, gasoline or diesel to meet job requirements. Get in touch with your Ka-Mo man or write for Ka-Mo engineering booklet today.

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World's Fair group formed

The gas industry is a member of the charter group of U. S. enterprises to participate in the 1964-65 New York World's Fair.

Chet Stackpole, AGA managing director, and Harold Massey, managing director of GAMA, announced the formation of Gas Incorporated. This group will plan and direct all activities related to creation and operation of a gas industry building on the fair grounds.

Officers of the corporation include John E. Heyke, Brooklyn Union Gas Co., president; William G. Hamilton, Jr., American Meter Co., vice president, and James Comerford, Consolidated Natural Gas Co., treasurer. Stanley B. Finch, coordinator for the gas industry in the 1939 World's Fair, is executive secretary.

The two-acre gas industry exhibit is expected to dominate the fair grounds. Most of the $5.5 million needed to plan, construct, and operate the building is expected to come from gas utility contributions.

Arrangements are being worked out for exhibits by all factors in the gas industry, including producers, pipelines, and distributors of gas, and manufacturers of household, commercial and industrial gas equipment and accessories.

Stackpole and Massey said that gas is the only complete industry represented in the charter Fair group, the others being individual companies.

The industry's concept of a Fair exhibit is expected to revolve around a visual recording of a "century of gas progress." The exhibit, however, will not "confine itself to the industry's past, but also will define its place in the space age. . . ."

OTS issues report on bending plastics

An improved method of bending plastic pipe is one of 70 techniques and devices recommended by the Navy for saving time and money in machine shop and other industrial operations.

A collection of these time- and money-saving suggestions is now available to industry through the Office of Technical Services, Business & Defense Services Administration, U. S. Department of Commerce, Washington 25, D. C.

This current collection of shop practice suggestions is the first in a series to be published by OTS. It is entitled "Bureau of Ships Shop Practice Suggestions" (PB 161715) and is available from OTS for 50 cents a copy.

Appliance manual published by AGA

AGA has published the third edition of its "Gas Appliance Service Manual." The new three-volume edition covers gas clothes dryers, ranges, water heaters, and incinerators.

The publication's companion project, the supplement subscription service, began a new three-year subscription period in September.

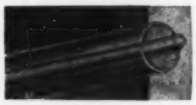
Prices and more detailed information are available from AGA headquarters, 420 Lexington Ave., New York 17.

Length after length . . . Mile after mile . . . Every inch of

BUSADA BUTYRATE (PLASTICS) GAS PIPING IS IDENTICAL!

IT'S CLEAR! YOU CAN SEE IT'S BY Busada

It is transparent . . . made from one specific material formulation containing the same physical properties shipment upon shipment. Its high quality is constant. Made to same O.D. as steel pipe with 2 wall thicknesses. Close tolerances insure leakproof, trouble-proof ease of installation. Complete line of fittings.



Butyrate pipe now available in black

Made by Busada Mfg. Corp., for

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Representatives in: Boston, Los Angeles, Shreveport, La., Kingsport, Tenn., Kalamazoo, Mich.

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PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

GOODMAN USED SINCE 1897 2" HANDLE & LOCKING SLEEVE GAS MAIN STOPPER

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Brooklyn 17, N. Y.
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Home economists cook in London

Four of the gas industry's top home economics and home service directors represented America in cooking Olympics at the British 1960 Food Fair held in London in September.

The U. S. team, one of 12 from as many countries, included: Mildred Endner, home service director, Minneapolis Gas Co.; Mrs. Elsie Alcorn, home service director, Milwaukee Gas Light Co.; Mrs. Ellen Bridges, AGA home service counsellor; and Margaret Spader, GAMA home service consultant.

Demonstrating the versatility of gas ranges, the home economists prepared typical American dishes in a model kitchen sponsored by the London Gas Council. The council equipped each kitchen with a gas range, refrigerator, and hot water heater. Each country's team had one 4-hour cooking period per day, with no more than four teams demonstrating simultaneously.

Pipeline institute slated for November

The fifth annual Natural Gas Pipeline Institute is scheduled for Nov. 15-16 in Liberal, Kan.

Sponsors of the institute are the Kansas State Board of Vocational Education, Southwest Kansas Petroleum Industry, the University of Kansas Extension and the Department of Petroleum Engineering.

Additional information on the institute is available from O. D. Calhoon Sr., University of Kansas, Southwest Kansas Center, Box 653, Garden City, Kan.

White-Rodgers expands

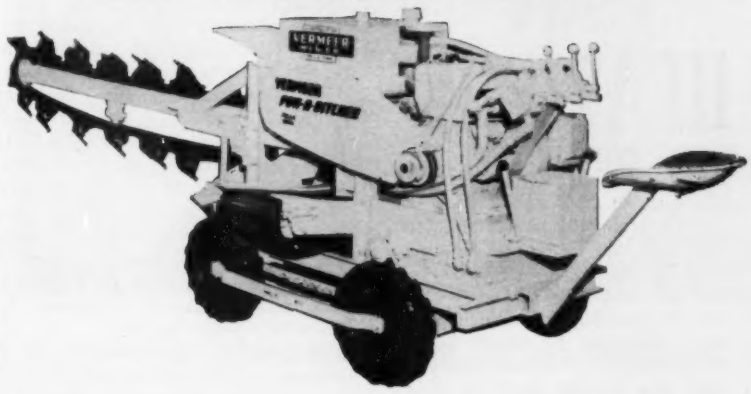
White-Rodgers Co., St. Louis, recently purchased two companies. In one action, White-Rodgers acquired the assets of the burner division of the Configured Tube Products Co., Bellwood, Ill. All products of the new subsidiary will be handled by White-Rodgers' field organization as part of an expanded sales program.

Also acquired was the Robinson Tool Fabricating Co. of Conway, Ark., manufacturer of sheet metal gas burners.

White-Rodgers' expansion plans call for construction of a burner manufacturing plant. The plant could be located either in St. Louis or in Arkansas.

NOW...THE NEWEST, FASTEST

SMALL DITCHER ON THE MARKET



VERMEER'S NEW MODEL W-3

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Designed Especially For Gas and Electrical Service . . . and Shallow Water Lines

Looking for a rugged, fast, powerful **small ditcher** that will really work? Vermeer's small-but-mighty W-3 Pow-R-Ditcher will fill the bill . . . an ideal unit for contractors, municipalities, utilities and custom operators. The W-3 is available with rubber-tired wheels or crawler tracks and features a completely hydraulic drive system. No gear shifting. An adjustable rubber belt conveyor deposits dirt on either side of ditch. If you are looking for a faster, easy-to-operate multi-purpose small ditcher, mail the coupon. Demonstrations are being scheduled now in all sections of the country. We will be happy to demonstrate the W-3 for you at your convenience.

Equipped with 18 HP Engine

- Digs 3" to 12" wide at 1' to 10' per minute — down to 4' deep
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PROTECTION for HIGH HAZARD AREAS with a HEATH "W" type survey

The hazards of Gas Leakage in the critical areas in your system can be minimized by regular Heath W type Surveys.

The W Type Survey was originated and developed by Heath Survey Consultants, Inc. to accurately locate and classify leaks in downtown and commercial areas—critical "high hazard" areas. Experts trained in finding and auditing leaks of all kinds make a thorough scientific inspection of your mains and services from border station to meter set.

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Honeywell forms new systems division

Minneapolis - Honeywell's new Special Systems division is aimed at "the advancement of the state of the art" of complex integrated control systems for industrial and military use.

The division will be headquartered at Pottstown, Pa., under John W. Morrison as general manager.

At the outset, according to Honeywell president Paul B. Wishart, Special Systems will include management, technical and production personnel of the Pottstown facility. Also included will be personnel and activities formerly located at the company's Brown Instruments division in Philadelphia and Industrial Systems division at Beltsville, Md.

Included in the overall control systems capability are divisions of the company's Industrial Products group, Temperature Controls group, Military Products group, Datamatic division, which produces electronic data processing equipment.

Venting report out

AGA Laboratories Report 1300 on "Sizing of Vent Pipe and Chimneys for Gas Appliances" has been published. It covers design procedures for individual and multiple appliance gas vent systems. Suggested multi-story vent design practices are also given.

Copies are available from the AGA Labs for $1.50 each.

Kraloy appoints

Kraloy Plastic Pipe Co., Santa Ana, Calif., has named two new field representatives. Steele & Associates, Atlanta, covers southern Louisiana, Mississippi, Alabama, Georgia, the Carolinas, and Tennessee. Nee & McNulty Inc., Tulsa, represents Kraloy in northern Louisiana, Arkansas, Texas, and New Mexico.

Designs custom panels

Walker & Associates Inc., Houston engineering firm, has formed a subsidiary to specialize in custom fabrication of automatic control panels.

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people • *Continued*

from page 117

R. C. BOWN is manager of sales for Allis-Chalmers control department, succeeding G. G. BROOKS, now in charge of industrial systems for Consolidated Systems Corp., A-C associate company. W. G. WILLIAMS succeeds Bown as manager of A-C's rectifier section . . . Manager of natural gas development at United Petroleum Co. is E. A. DOVENBERG . . . Delco-Remy Division's new regional sales office in Milwaukee is headed by JOHN R. MAIL.

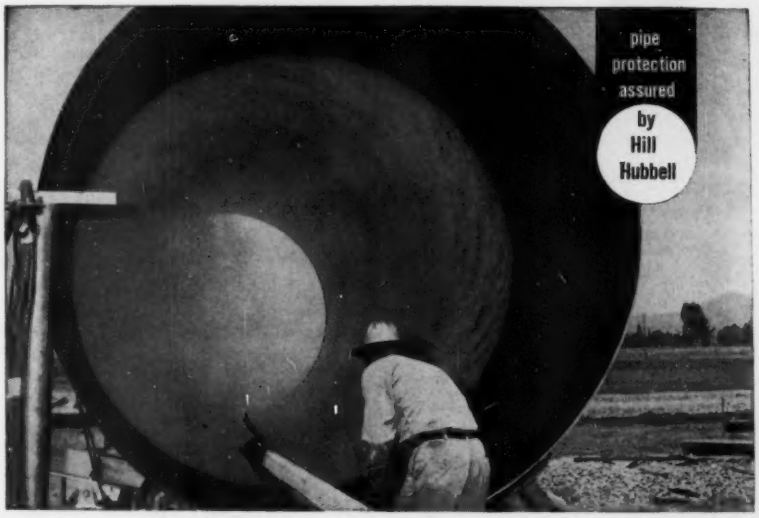
ALFRED VILCINI was named to the new post of director of operations for Controls Co. Canada Ltd. . . . HAROLD H. HEIDRICK, formerly with Pacific Gas & Electric and the California PUC, has been named public utilities consulting engineer for Wilsey, Ham & Blair, engineering and planning firm in Millbrae, Calif. . . . New appointments at Allis-Chalmers Manufacturing Co.'s construction machinery division include: H. T. LARMORE, general products manager of the division; J. M. HAILE, northwest region manager; G. E. HALL, eastern region manager; A. L. LOWERY, central regional manager; L. D. MYERS, southern region; K. A. NEW, northeast region; J. T. SKINNER, western.

FRED B. HARTNEY JR. is general sales manager of Utility Appliance Corp.'s Gaffers & Sattler Product division . . . JOHN N. ROLSTON has joined Commonwealth Associates Inc. as business development representative for consulting and design engineering services . . . B. D. WIESMAN was named sales promotion manager RCA Whirlpool refrigerators and freezers when QUENTIN B. GARMAN was promoted to national advertising manager.

Deaths

MYRON G. THOMAS, 49, division manager for Southern California Gas Co.

ROBERT H. WHIPPLE, 76, former assistant to the manager of Philadelphia Electric Co.'s gas department. Whipple retired in 1955 after 47 years with the company.



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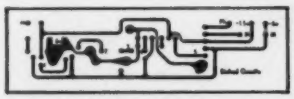

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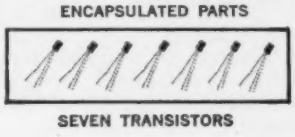

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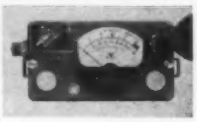
J-W SNIFFER, Model G, is used for a general-purpose combustible gas detector. Scale is graduated from 0-1.0 l.e.l. (lower explosive limit) for all common gases and vapors. Light in weight (4 lbs.), simple to use and maintain.

J-W GAS-POINTER, Model H is ideal for testing barholes for underground leaks in natural gas lines. Also used for testing manholes, valve boxes, etc. Two scales: 0-1.0 l.e.l. and 0-100% (pure) gas. Exclusive design eliminates electrical switching or zero shift when changing from one range to the other.



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GAS ASSOCIATIONS

PCGA chooses 1960-61 leaders

New officers and directors were elected at the recent annual meeting of the Pacific Coast Gas Association in Phoenix.

They are: President, H. G. Dillin, executive vice president, San Diego (Calif.) Gas & Electric Co.; 1st vice president, William J. Bailey, president, Day & Night & Payne Co., LaPuente, Calif.; 2nd vice president, S. L. Sibley, vice president and general manager, Pacific Gas & Electric, San Franciso; and treasurer, L. W. Coughlan, comptroller, PG&E.

Directors: Lloyd Cooper, California-Pacific Utilities Co., San Francisco; O. Marshall Jones, Cascade Natural Gas Co., Seattle; Ralph Gibson, Intermountain Gas Co., Boise, Idaho; W. T. Nightingale, Mountain Fuel Supply Co., Salt Lake City; B. T. Poor, Washington Natural Gas Co., Seattle; Walter S. Lee, Major Controls Co., Corona, Calif.; and H. A. Proctor, Southern California Gas Co., Los Angeles.

Inglis succeeds Moshier in AGA post

Lester B. Inglis Jr. has been named assistant secretary of AGA's 3700-member operating section. He succeeds Fredric Moshier, who has entered private business.

Inglis has served for the past four years as an engineer in United Fuel Gas Co.'s gas measurement department.

Metal treating symposium slated

American Gas Association, Bridgeport (Conn.) Gas Co. and other Connecticut utilities are sponsoring the first metal treating symposium in Westport, Conn. It is scheduled for Nov. 3 at the New Englander Motel.

The program is designed to appeal to top metallurgists and company officials in charge of plant production.

CNGA elects officers

J. A. Smith, superintendent of gas and gasoline plants in the Los Angeles division of Texaco Inc.'s domestic producing department, is the new president of the California Natural Gasoline Association.

Among new directors of the association are E. H. Fisher, Pacific Gas & Electric; Warren F. Kane, Clark Bros. Co.; and J. A. Millen, Southern Counties Gas Co.

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Gas Fired, two years old
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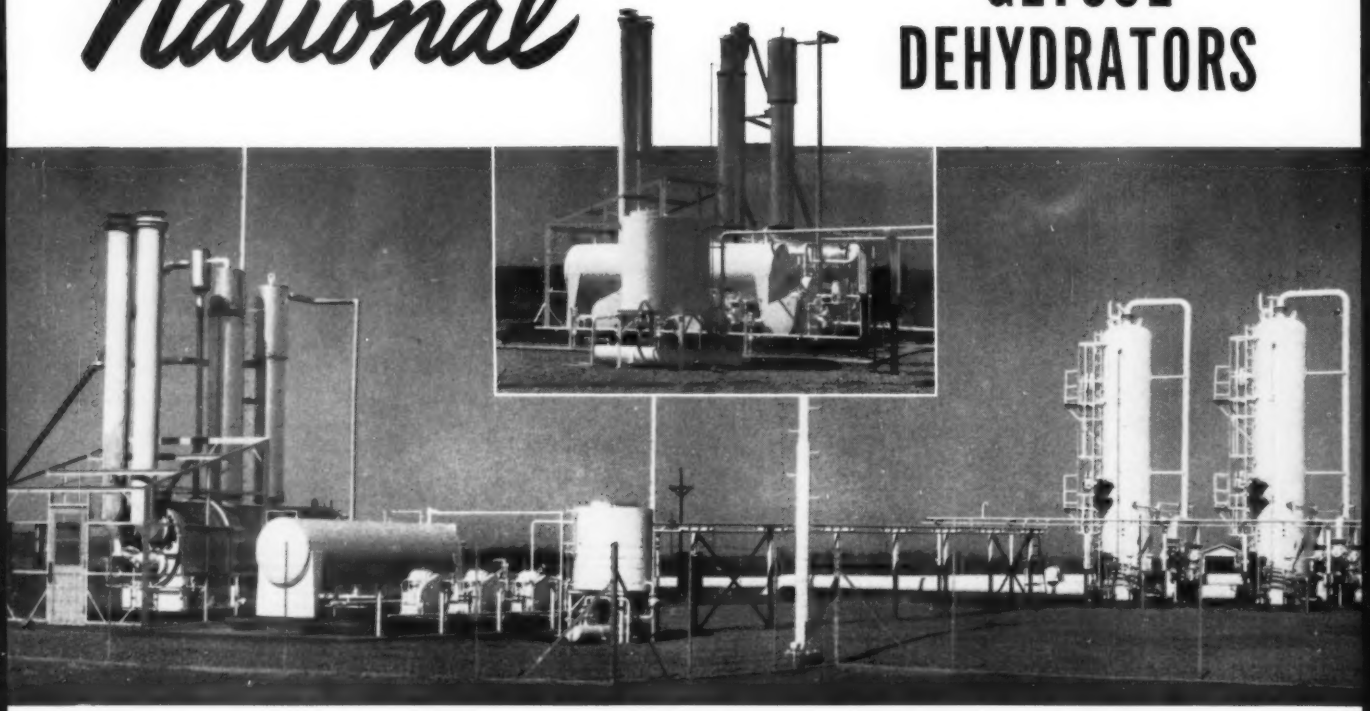

180,000,000 cu. ft./day capacity unit located in the southwestern United States. Installed downstream from a large compressor station.

Automatic Compact Glycol Dehydrators provide for absorption of water from the vapor phase into the dry glycol in the absorber tower. The wet saturated glycol is reconcentrated, followed by recirculation back to the absorber to begin its job all over again.

Glycol Dehydration provides the lowest initial installation cost over other systems and will dry gas to pipeline specifications for most operating conditions. Standard units are available in capacities from the small individual well type (2,000,000 cu. ft./day) to the large central installation (200,000,000 cu. ft./day). Alternate features include winterizing for extreme cold weather operation, housing, integral inlet scrubbers and electric driven pumps.

Designed and engineered to afford "packaging" of greatest per cent of the complete unit.

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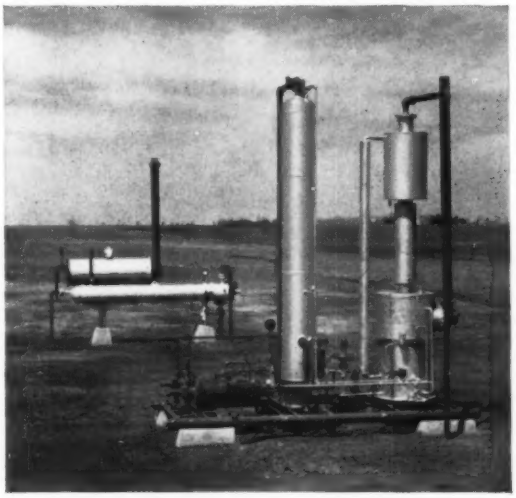

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GAS staff report

TERRA ALTA

The story of a storage field, a compressor station, and a pipeline

By WILLIAM T. HARPER • Eastern Editor

"FROM the wellhead to the burner tip" is and has been the story of the natural gas industry. This journey may stretch 2500 miles from Texas to New England. It may span 1800 miles across the Southwest to reach into California. It may sweep 2300 miles across Canada from Alberta to Montreal. Or, it may vertically stagger 43.3 miles from Terra Alta to Seneca Rocks in West Virginia.

Such is the story of Project X-76, Atlantic Seaboard Corp.'s $25-million construction of facilities to bring natural gas from the wellhead to the burner tip. Of course, the wellheads in this case are located over a storage field and the burner tips involved directly are only a few belonging to free gas consumers in the field. But it is the complete story—if only in miniature.

The story starts back in 1957. Atlantic Seaboard, then as now, was a part of the vast Columbia Gas System. With headquarters in Charleston, W. Va., and directed by President John W. Partridge, Atlantic's role is transmission. It takes its gas at Cobb compressor station about 25 miles northeast of Charleston

where it comes in from United Fuel Gas Co., a Columbia subsidiary. From Cobb, Atlantic transmits the gas through its Toughest Inch pipeline, across the Allegheny mountains and on to its major customers, Washington Gas Light Co., Baltimore Gas & Electric Co., and Commonwealth Natural Gas Corp. of Richmond.

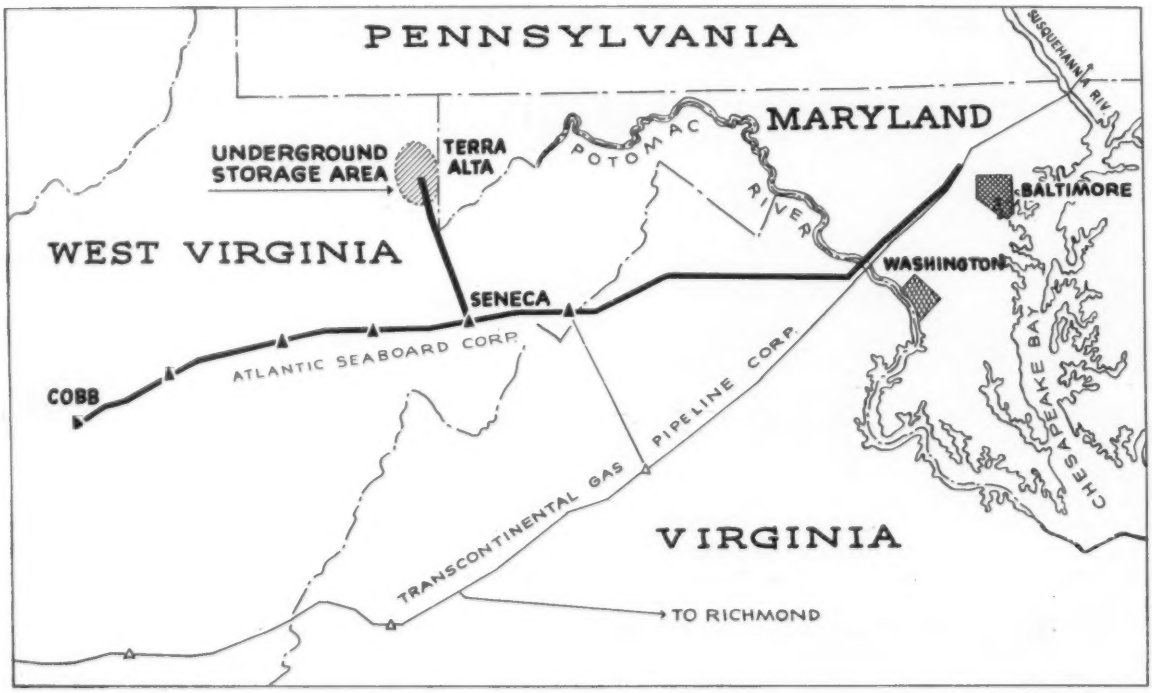
The need for more and more natural gas in this area has been the same as throughout the country. Population explosions and industrial expansions have taken place here, too. Total population for the three-city area has risen almost 100,000 people a year for 10 years. The national government has grown larger and more complex and, in so doing, has brought more families into the District of Columbia, making it the ninth largest metropolitan area in the nation. Industry and seaport commerce have made Baltimore the seventh largest city in the United States. Commercial, industrial and agricultural growth and development have blossomed Richmond into more than a tobacco town and site of the Confederate Museum. New customers have been coming onto the lines at a rate of better than 500 per week in these three cities. In the decade of the Fifties, Washington's area population increased 34.5 per cent, Baltimore's went up 21.4 per cent, and Richmond's 23.8 per cent.

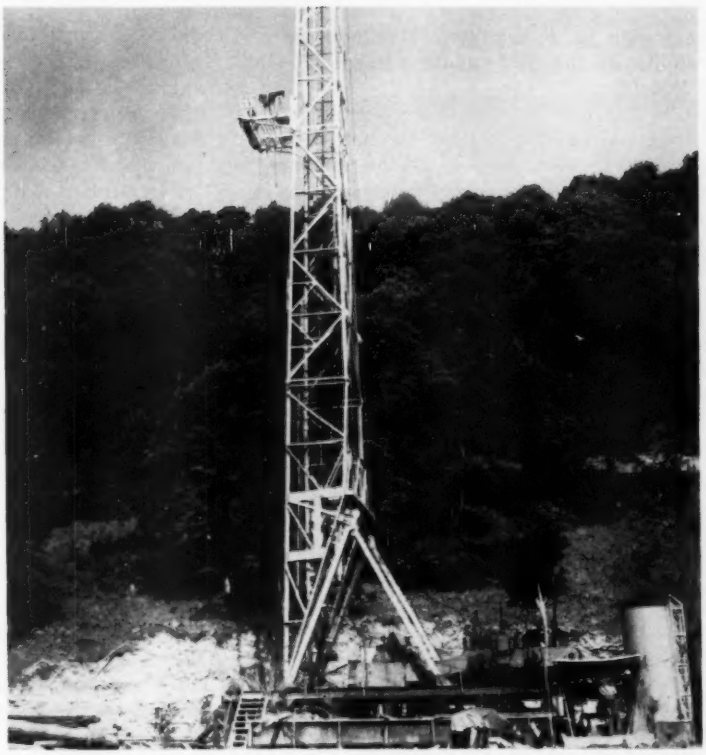
How to meet these ever-growing demands for more natural gas was a problem facing Atlantic Seaboard. Most of the main 26-in. line coming in from Cobb compressor station had already been looped. So, it was decided to utilize the advantages of underground storage. Not only would this make more gas available during winter, it would also reduce gas costs through off-peak season purchases. Then, too, the gas would be on hand for quicker delivery to combat sudden cold snaps that hit the areas. And, underground storage would also help Atlantic stabilize its take from United Fuel and postpone the need for additional line looping.

This decision made, the next step was to find an area susceptible of conversion to storage operation. Several areas were considered (Columbia was already operating 19 active storage pools in West Virginia). The one chosen was about two miles southwest of the little town of Terra Alta, W. Va. (Pop. 1649). In that area Hope Natural Gas Co. of Clarksburg, W. Va., owned 2700 acres of production lease holds and producing gas wells. And the Cumberland & Allegheny Gas Co. (another Columbia subsidiary) held production facilities and wells. The total area encompassed by both was 10,200 acres.

Exploration and production history of this area goes back to 1924 when a 4900-ft well was sunk. Although this initial try was abandoned, a dry hole was completed into the Oriskany sand 20 years later. Three wells and three years later, in 1947, gas was finally hit. The operators entered into a gas purchase agreement with Cumberland & Allegheny and in 1951, C & A purchased part of the field in order to step up drilling and gas production.

Hope got its first production from the field in 1948 and built its first lines into the Terra Alta area three





Jack-knife rotary rig working over an injection-withdrawal well in the Terra Alta storage field.

years later. The field was the scene of highly competitive drilling during its period of greatest production. At the time of conversion to storage, it was estimated to be 90 per cent depleted of recoverable gas.

Negotiations were entered into by Atlantic for purchases from Hope and C & A. Atlantic purchased the production facilities, wells and lease holds from Cumberland & Allegheny for a depreciated value of $3.4 million. The total depreciated cost of all physical property and Oriskany gas reserves acquired from Hope will amount to $2,640,000. Local property owners, whose royalty payments were discontinued when production in the field was halted and who were paid in cash for their royalty on unproduced gas, will once again receive payments with their leaseholds placed on a storage-rental basis.

The storage pool was thus located about 45 miles almost due north of Atlantic's Seneca compressor station, situated on the company's main 26-in. looped line. This then made Project X-76 a three-phase affair. First would be the re-conditioning of the old wells in the storage field plus drilling others where necessary. Added to this phase was the laying of the network of gathering line from the wellheads into a mainline (designated as X-76-M-1) running down to the compressor station near Terra Alta. Construction of this station would be the second phase of the project, and the mainline (WB-3) running from it to Seneca station would be the third. Work on all three phases was to be done concurrently. Taking this story from the wellhead to the burner tip, let's start with the storage field first.

In the field as purchased by Atlantic, there are 41 wells. After preliminary studies of the pool, it was decided to recondition 21 wells for the injection and withdrawal of gas. An additional 12 wells, located on the perimeter of the field, will be used as observation wells. One more is being drilled out and one new one is to be drilled. Pressure checks will be taken from time to time on all of the wells to determine reservoir characteristics.

Wells range in depth from 4900 to 6200 ft. Individually, their production is anywhere from 500 Mcfd capacity to 30 MMcfd. Total capacity of the field will be 33 billion cu ft, stored at pressures up to 2350 lb. Including native, cushion and stored gas, ex-

pected capacity will be 45.8 billion. Maximum peak day deliverability of the field, under present plans, will be 255 MMcfd.

All of the wells when purchased by Atlantic had 7-in. casing. Only one of these original casing strings was used. In the others, Atlantic sank new casing inside the old. Two of the wells now have 5-in. casing and the rest all 4-inchers. Reconditioning of the wells was done in 1959 from April through December, averaging about three weeks per well. In nine of the wells, a rotary rig was brought in to go on through the Oriskany. Delta Drilling Co., Tyler, Texas, did this work. For routine cleaning out of the original casing, James I. Sheers, a contractor from Indiana, Pa., used two 48-L spudders going down only as far as the chert.

Before running new casing and cementing, Atlantic ran Schlumberger electric logs to locate productive zones and to tell where to perforate. Then with the new casing in place and perforated, mud cleaning acid was run through the perforations to get the muck out. After that, anywhere from 2000 to 20,000 gal. of hydrochloric acid was forced in to open the formations. This enabled well capacity to be increased anywhere from 100 to 1000 per cent, according to H. C. Mefford Jr., Atlantic's superintendent of production and storage. The new 4½-in. tubing strung from top to bottom inside the old 7-in. casing is J-55 grade steel and weighs 12.6 lb per foot.

In the spring of 1960 all of the wells were tied in together in about three months. The size of the well casing determines the gathering line size, ranging from 4- to 8-in. OD. There is one gathering line coming off each well except for the 7-in. and two 5-in. heads. In these cases the wells are tied in with double arms. All of the gathering lines—about 6.5 miles in total—are increased in size by steps until they tie into a 20-in. line at the center of the field. This line runs two miles down to the Terra Alta compressor station.

The field will be attended at all times. Atlantic will have men there taking pressures, changing charts and doing general maintenance on the wells. In order to account for volume of gas delivered into or withdrawn from the storage pool, a master measuring station is located in the compressor station lot on the market side of the storage pool. The measurement is accomplished through the utilization of four 10-in. ASA 600# two-way orifice meter runways. Inlet and outlet headers for these runways are of the doughnut type in order to give better distribution of flow through the station. Two Foxboro Type 28 non-integrating flow meters are provided for each runway. One flow meter registers the differential and pressure of volumes of gas flowing to storage, while the other gauge registers the differential and pressure of volumes of gas being withdrawn from storage. Each runway is equipped with a Daniels Flangnek Jr. orifice fitting which greatly expedites the change and inspection of orifice plates. The runways are also equipped with look boxes which also facilitate the visual inspection of the internal condition of the runways.

Each well will have its own individual measuring station capable of measuring volumes of gas stored or withdrawn. This will enable Atlantic to know what each well is doing and whether or not it needs any attention. A methanol injector is installed on each wellhead meter run to eliminate the possibility of freezing. All of the gathering lines have Rockwell Nordstrom 1-in. RP&C drip valves. If any fluids, such as salt water, are discovered coming through, the lines will be blown right into a tank which will be used to catch the drip.

All gathering lines are designed for operation at 2500 lb and have been hydrostatically tested to as

PIPE SIZE CHART

(for WB-3 line)

Type	Feet	Size	Pounds per ft.	Wall Thick.	Tonnage	Usage
X-52	4,740	20-in.	78.60	.375	186.282	Road crossings
	760	20-in.	104.13	.500	39.564	Railroad and creek crossings
	221,348	20-in.	65.71	.312	7,272.385	Mainline (WB-3)
			(for X-76-M-1 line)			
T-52	12,780	20-in.	139.32	.675	890.200	Mainline (X-76-M-1)
	230	20-in.	166.40	.812	14.136	Drips, piping outside compressor discharge.

Exterior view of Terra Alta main compressor building. Tom Peyton (left) was Atlantic Seaboard's construction engineer for Terra Alta station. D. L. Williams (right) was construction supervisor for Pritchard Co.

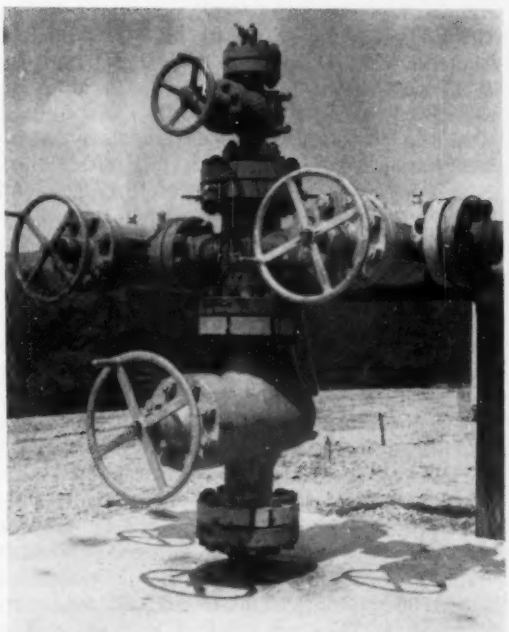
Below: Compressor machinery undergoing installation. Four 1050-hp units were installed, with a block poured for the fifth.

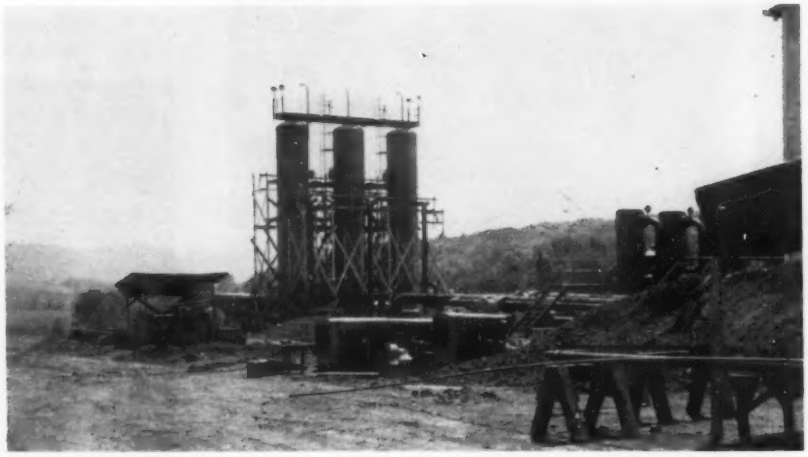
much as 3200 psig. All of the lines are underground, coated and wrapped. Future plans call for rectifiers to be installed. Due to a large number of abandoned facilities in the area, it will have to be surveyed and generator-tested. The pipe was mill-coated by Hill, Hubbell. The material is fully plasticized, coal-tar based, multiple coatings to bring enamel thickness to not less than 3/32 in.

The pipe in the storage field and the 20-in. line running from it to the Terra Alta station was purchased from National Tube Div., U. S. Steel. It is a new type of pipe called Special High-Strength Seamless line pipe, Grade T-52, used for the first time on this project. The high pressures involved in putting the gas into storage required very strong pipe and it was found it would be impossible, because of the high chemistry needed, to produce a Grade X-52 pipe with the necessary wall thickness in a weldable field product without pre-heating and stress relieving. By adding small alloying elements to its Tri-10 pipe and changing the analysis, National was able to produce T-52 with a 0.675 wall thickness and a weight of 139.32 lb per foot suitable for use in the Type-A construction. And it still has a 52,000-lb yield strength. For the drips and at the discharge end of the compressor station, Type-B construction was used with a 0.812 wall thickness with a weight of 166.40 lb per foot.

The storage field itself has been divided into four sections with three, seven, three and eight wells in each section, respectively. All of the wells in each section are tied-in together and each section is remotely controlled from Terra Alta station. This is done by means of an electrically operated (via underground cable), 16-in. Nordstrom-Hydroseal plug valve

Wellhead unit on a storage injection - withdrawal well.





Bank of dehydrator towers goes in for the Terra Alta station.

equipped with an EIM E-2 valve operator. These four valves can control the flow into or out of any one section at a time, in or out of any combination of sections as desired.

This is done by sensing the pressure from the field and changing it into electrical energy while, at the compressor station, electrical energy is sensed and changed into pressure by means of transducers. Then during withdrawal periods any one of those four valves can be operated to give whatever suction pressure is necessary. That way energy is saved because only minimum pressure cuts at the station will be required. This is expected to increase the efficiency of the reservoirs well above any of the others in the system.

On the wellheads, McEvoy valves are used along with National Supply Co. 3000-psig WOG Christmas trees. Each wellhead also has a Nordstrom 1500 blow-off valve tapped off on a 4-in. line. All the valves throughout the field are ASA rated at 1500 with Nordstrom 6049½'s being used on the 12- to 16-in. lines and 3049½'s on the 4- to 8-in. lines.

Regarding future expansion of the field, Ray Brothers of Charleston will drill one more well on the western edge for Atlantic. Geologic study indicates the structure probably will contain water. But the company wants to be sure the study is correct. If it does hit anything, it is possible that more wells will be drilled in that area.

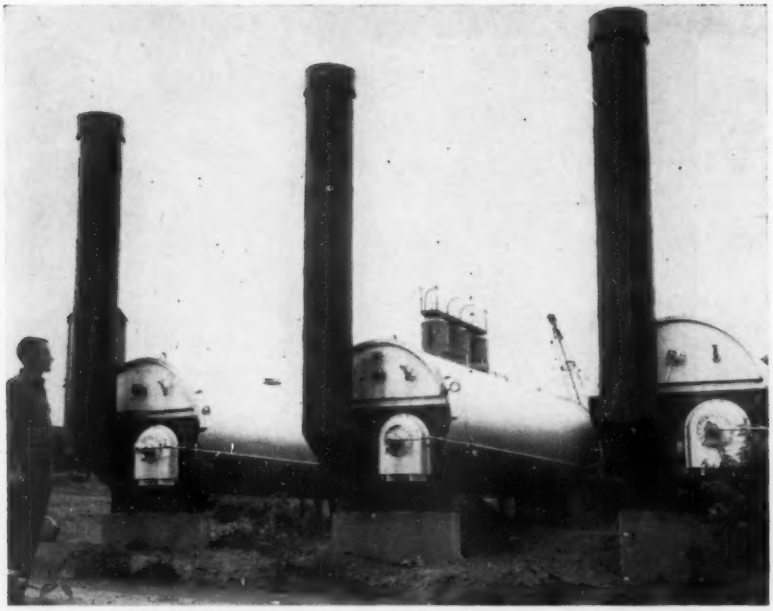
Using discharge of gas as the theoretical pattern for this story, it comes from the field down to the Terra Alta compressor station. Thus, the second phase.

The horsepower for this station is wrapped up in four 1050-hp Clark TRA-6 engines with integral compressors. They are exhaust turbocharged, inline engines and are two-cycle pulse generated internal combustion types with direct reciprocating compressors driven off the main shaft. The power cylinders are mounted vertically and the compressor cylinders horizontally. Full speed on these prime movers is 330 rpm. A block has been built in the station on which a fifth engine is to be mounted in the future.

The height of the station location—2700 ft above sea level—was one of the prime reasons for selection of the turbocharge type of engines. The rarified atmosphere means that non-turbocharged units must be derated. Present plans call for the engines to be manually operated at constant speeds and there is a possibility of shifting to automatically controlled variable speeds later on to give proper flow control. The in-storage range will vary from 750 to 2500 psig, while the out-of-storage suction pressures will vary from 550 up to 1000 psig. Thus, unloaders are necessary on the cylinders to give full load at every condition. Another complication in selecting compressors for this station is that two-stage compression is necessary when pumping into storage and the ability to fully load the units is desired.

Everything in the station is fire-proofed. Transite-covered steel frames are used in the buildings. Everything else is metal and concrete construction. With the absence of noise-control designing, such as thicker walls (Terra Alta station is in a completely remote locale), this station is not as tightly sealed. It is felt that the normal ventilating system is adequate to carry off what little gas might escape, so no monitoring system for gas detection was built in.

The high pressure piping at the station is all above-ground. The company was able to stay away from



Field heaters, such as these furnish heat for regenerating dry-bed desiccant in dehydrators and ahead of regulators to prevent hydrate formation.

stress relieving, even though the design is for 2700 psig, by having a maximum 14-in. discharge size. That kept the wall thickness of the X-42 pipe under 1 in. The suction side piping is also primarily X-42 for a 1200-psig design pressure. For the underground piping, cold-type coating was felt to be better than the hot-type in this installation. The lines were cleaned first with wire brushes and then a coating of Roskote, one of glass wrap, and another of Roskote was applied. It is believed that such a covering should be satisfactory for the temperatures anticipated. In addition, 40 Dow Chemical Co. 32 lb—16 in. high potential packaged magnesium anodes are distributed throughout the yard to supplement the protection obtained by the pipe coating.

Natural gas coming right from the dehydrators will be used as fuel for the engines. The fuel is measured into the engines and auxiliaries by means of a Roots-Connersville meter that measures all the station's fuel plus pitot connections that are set up for individual measurement. The engines are unitized in accordance with the Columbia code which specifies that the lube oil and jacket water cooling be provided independently for each engine. This is a physical piping unitization. Each engine has its own surge tank, fin-fan with hydraulic drive, etc. Glycol or alcohol will be used as anti-freeze in all of the main units due to the extremely cold climate encountered. The station is designed for minus 10 deg F ambient for building heating and plus 90 deg F ambient for the jacket water and inter- as well as after-gas coolers.

Jacket water pumps are located on the main engine. Heat loads are dissipated by fin-fan coolers with hydraulic motors powered from a hydraulic pump that is driven off the crankshaft of the main engine. A by-pass arrangement controls the fan speed and correspondingly the water temperature to the engine.

The dehydration plant is a three-tower, dry-bed type. Activated alumina will be used in the beginning because during the first few years the station will not be up to capacity and fluorite will handle all the water expected during that time. When the plant gets up to full load, it is expected that silica gel will be used.

The three-tower system operates on eight-hour cycles with two towers drying the gas and one reactivating the drying elements. It is of standard design in that after the beds are saturated, gas at about 450 deg F is run through the tower to drive off the liquids. After these are trapped and condensed, the gas then runs back into one of the drying towers. This results in about a 7-lb suction loss, according to Tom Peyton, Atlantic's construction engineer at the station, but the system has proved itself very satisfactory.

Atlantic chose a dry-bed type of dehydration plant because it is expected to take the dew-point down to the desired 0 deg F at the temperature flowing out of storage. The critical point on this design was in-storage where injection pressures may eventually reach 2500 psig. Even the gas from the Southwest with a maximum of 7 lb per million of water in it was felt to be too wet. So Atlantic will dry it even more to prevent it from contaminating the well face.

Experience has shown Atlantic that gas going into storage must be cooled to protect the well pipe and casing against expansion. At one time it was felt that as far away as the storage field was from the compressor station, the gas temperature would drop during that journey. Actually, it was found that the

Pine trees, rock, rattlesnakes, and steep slopes were problems for the mainline spreadmen.

ground around the pipe heats up and in the summer there would be less than a 10 deg temperature drop between the station and wellhead. This retention of heat could cause the wellhead to pull out of the ground. So, Coyne gas after-coolers were installed to knock the gas down from a full operating-pressure temperature of around 200 deg F to about 110 deg. Cooler fans are driven by 25-hp, 440-v electric motors. Electric power for these motors as well as other requirements is generated by 250-kva electric machinery Westinghouse generators powered by 450-hp Roiline gas engines.

When the gas is withdrawn from storage, another problem is faced: hydrate formation. With the gas coming out at nearly 2500 psig, it must be cut to 1050 psig because that is the maximum the contactors are designed to take. That means about a 1500-lb drop in pressure. Figuring roughly on a 7-deg loss in temperature with each 100-lb pressure drop, it would mean an overall temperature loss of about 100 deg. For example, with 60 deg F gas wellhead temperature, such a pressure drop would tumble the gas temperature down to minus 40 deg. F. Naturally, this would form hydrates and ice particles. To overcome this, Atlantic will provide enough heat ahead of its 8-in. Fisher regulators to raise the temperature of the gas coming out of storage by 90 deg—up to about 150 deg. Then when the temperature falls as the pressure drops, it will be back down to around 60 deg F when it goes through the regulators. To do this heating, National Tank indirect water-bath heaters producing 3 to 4 million Btu will be used.

Since it is necessary to regulate pressure when gas is being withdrawn from the storage pool, a regulating station is installed on the field side of the compressor station. This regulating station consists of two monitored 6-in. ASA 1500# Fisher Type 472 H diaphragm motor valves. These regulators are positioned by Fisher Type 4160 Wizard controllers which transmit a 5- to 35-lb signal to a positioner mounted on the motor valve top works. In order to provide for maximum safety features, each monitor regulator is provided with a separate controller while the primary regulators are controlled by one instrument. The supply of gas and control taps for each instrument are separate to again assure maximum safety. The supply of gas passes through Silicagel type dryers and is then filtered before passing through a series of staged regulators which supplies the controller with the necessary gas pressure.

Flow control for the Terra Alta storage pool is accomplished by using 10-in. Nordstrom plug valves installed on the outlet of each meter runway. These plug valves are equipped with Nordstrom operators. A Foxboro Stabilog indicating flow controller Type M/40 with adjustable pneumatic set delivers a 3- to 15-lb signal to a Republic valve positioner mounted on the Nordstrom actuators, which in turn position the plug valve for any desired rate of flow. This will enable the station operator to exercise control over the volumes of gas delivered from the pool at the discretion of the dispatcher. The Foxboro controller can be set remotely through the utilization of instrumentation located at the compressor station control board. A Foxboro D/P cell senses the differential pressure on the primary runway and transmits same

Here, construction vehicles and equipment are winched up a too-steep grade on the ROW.

to a dual ribbon indicator located on the compressor control board. A small pressure regulator, also located on the station control board, can be manually operated to raise or lower the set point on the Foxboro Stabilog. This enables the station operator to change rates of flow from the control board, eliminating the time which would normally be required to walk to and from the measuring station location.

System procedures specify a minimum of 350 ft between the fire gate and the main building and a maximum of 1500 ft. The closest fire gate at Terra Alta is over 400 ft from the main building. By triggering any of the numerous safety stations, all the gas coming into or out of the station can be closed off and the lines blown down in less than five minutes. This is all done pneumatically with code-specified plug valves. Nordstroms again are used for this with the operators being the pneumatic-cylinder type.

Atlantic feels that the underground storage process might produce some natural gasoline—although how much is not known yet for sure—despite the fact that the gas has been stripped more than once during its journey from Louisiana and Texas. This has been true in other storage fields and the company is ready for it here. The compressor station, costing $2,977,000, was built by J. F. Pritchard & Co., under the supervision of L. D. Williams.

Atlantic figures it made quite a cost saving by eliminating all 20-in. valves from the storage field and Terra Alta compressor station areas. The maximum size used was 16-in. To do this, the 20-in. lines were reduced to 16-in. by using Tube Turns Weld-Ins.

So, now the gas has come from the storage field and through the second phase, the Terra Alta compressor station. Thus, from the wellhead, the gas is now on its way to the burner tip. The carrier for this last phase of the journey is a 20-in. OD pipeline, designated as WB-3. Terrain, testing and time were the three main obstacles in this final leg.

On a road map the terrain of this 43-mile segment of West Virginia looks deceptively easy to travel. But, a quick glance at a contour map shows that just the opposite is true. For instance, in one stretch of less than 3.5-miles, the terrain drops from 4500 ft to about 2500 ft and then bounces up again to about 4430 ft above sea level. That, friends, is for mountain goats and not pipeliners.

Speaking of the terrain, Leo J. Payne, assistant superintendent of Atlantic Seaboard's "B" system, said, "In some cases, it looked like we were the first human beings ever to come anywhere near the area. The only things we found there were pine trees, rocks and rattlesnakes." The mountains are so steep that many times, tractors, trucks and equipment had to be winched together, three and four in a line, to keep them from tumbling down into the valleys or over the edges of the right-of-way. A veteran pipeliner working on the Williams Brothers spread called it the toughest thing he had ever seen outside of the lines he had worked on that crossed the Great Smokies in Kentucky. On the other hand, one section of WB-3 runs through a mile-long swamp.

Despite the ruggedness of the terrain, the chosen route actually saved the company 28 miles of pipeline as compared to the best alternate route. The ROW was surveyed by a helicopter making repeated passes

And still more ups and downs on the mainline.

over it as low as possible. It is estimated that this survey method saved Atlantic many thousands of dollars over conventional methods. Using the base line as determined from the helicopter surveys, plus 10 per cent, the pipe was purchased and the orders came out almost to the foot of what was needed.

From Terra Alta to Seneca the mainline runs 43.3 miles and is all 20-in. OD seamless pipe. This too was purchased from National Tube and is its standard X-52 with, generally speaking, 0.312-in. wall thickness. The exceptions to this are 4740 ft of 0.375-in. wall for road crossings and 760 ft of 0.500-in. wall for railroad crossings. The entire line was hydrostatically tested for 1160 psig operating pressure. WB-3 was doped and wrapped in the field over the ditch with coatings by Koppers, Barrett, Reilly and Pitt Chem. It was then cradled right into the ditch. After completion of a further survey, the line will be cathodically protected with rectifiers. WB-3 is also completely insulated from both the Seneca and Terra Alto stations by means of insulating flanges.

The best "spread day" saw 6668 ft of the mainline welded together. Standard 30-deg bevels were utilized as was an 85-P rod for welding. The best day made by the coating crew was 10,000 ft. Rain washed out 20 days of pipelining. All of the 20-in. line was put in by one Williams Bros. spread under the supervision of Earl Saulsman. Payne, who has lived with this project practically from its inception, was enthusiastic with his praise of this spread. "This is one of the best contractors that Atlantic Seaboard has ever had. They used more equipment, did more work, and averaged about a mile a day of pipelining. Through this kind of country, that is pretty good time," he stated.

Adding to the construction difficulties was the fact that approximately 23 miles of the line was put in through National Forests. This limited the ROW to 50 ft and in one case, Atlantic was requested to close off its four-mile access road to preserve the natural beauty of the park.

The line was welded together usually in 40-ft sections using visual inspections on both the front and back-end welding. Approximately 67 per cent of the welds were X-rayed and the entire line was gone over with a holiday detector after the coating operation. In addition, Atlantic had 13 of its own inspectors on the spread.

Problem number one, terrain, was directly responsible for problem two, testing. Columbia's code calls for hydrostatic pressure testing of all pipelines of X-52 and up in sizes 16-in. OD pipe and above. In this area with its tremendously sharp elevations, the test-

ing difficulties were acute when it came to filling the line with water and then dumping it out. For instance, in one 22-mile test stretch, an average of 1400 gpm of water was pumped into the line against nearly a 400-lb head, due to pipe elevation. This meant that 1,750,000 gal. of water was needed. It took almost 24 hours to get the water into the pipe. Then it took another four hours to pump the water up to reach a maximum test pressure of 1647 psig (the minimum test pressure, set by Columbia's code, is 1.1 of operating pressure, or 1276 psig). As there were only two water crossings of any consequence along the entire length of the line (Red creek and Blackwater river—and sometimes it's hard to tell which one is the creek), getting enough water presented another problem. Even so, a thorough testing job was done as illustrated by the fact that in one 12.5-mile stretch, three test sections were set up at intervals of 9, 2.5, and 1 miles. The elevation range here was from 3100 to 4400 ft.

The third problem, time, was not brought about by either of the first two. It came from delay in obtaining regulatory approval. Atlantic filed for this project in early 1958, hoping at the worst the project would be in operation in time for the 1959-60 season. Because of the fact that Atlantic was purchasing production property from Hope and Hope's accounting for the transaction also required Federal Power Commission approval, it was not until Jan. 14, 1960 that FPC granted a temporary certificate. Even this was of uncertain value due to a condition imposed. Likewise, Atlantic encountered delay in obtaining SEC approval to certain aspects of the transaction so that it wasn't until late Spring 1960, that all regulatory approvals had been obtained. Finally, with all hurdles cleared, Project X-76 was under way but only in time to deliver less than half of its proposed capacity for the 1960-61 season. Of course, such delays cost money as, for instance, pipeline construction costs continue to rise. Payne estimated that the delay cost Atlantic $200,000 in pipeline and field costs alone and there were substantial other increases over and above this.

But, getting back to the construction of WB-3, there are four 20-in. valves on the line that can serve to isolate various sections from each other. These are located approximately 10 miles apart. They are buried underground with Shafer operators and are set to close with a 20-psig drop per minute in pressure. Blow-down and by-pass connections are provided at each one of these valves.

On-stream pigging is not practiced by Columbia so the lines here were cleaned good prior to installation. With nine drips on this line, three more on the Terra Alta station to the field line, and 61 expansion-type drips in the field plus dehydration at the station, it is felt the line will stay clean enough to eliminate the need for future pigging or scraping.

Presently, the entire project is fully attended. However, future plans call for it to be included in Columbia's vast completely automated system. As far as communications from the Terra Alta field, the compressor station and the field production office are concerned, they will be connected to Atlantic's Charleston Falls Church full period line. This is a telephone line that picks up all points along the 26-in. system line. That will provide them with a talking circuit to the Charleston office, the Falls Church office, and to any points along the 26-in. line.

A telemetering system to transmit five pressures from the storage field to the compressor station has been installed along with a supervisory control system for operating the four areas in any order that the operator at the compressor station desires. The telemetering equipment is Honeywell's PPI. It will measure the pressure in each of the four areas, plus measuring the pressure on the suction side of the storage field. The pressures are measured by the transducers and converted to a current. These pressures run in the zero to 3000 range. This current is transmitted through a 25-pair, No. 19-gage telephone cable that's buried beside the pipeline from the field to the compressor station. These pressures are con-

After hydrostatic test on a mainline section, water bleed-off is started.

Block valve assembly is lowered into bellhole for welding-in.

verted to a current and transmitted to the auxiliary building at the compressor station where the receivers pick up the current and convert it back to a pneumatic signal. This is a 3-15-lb signal which is then transmitted pneumatically from the auxiliary building to the compressor station itself. The reason for this converting back to a pneumatic signal is to meet the code for hazardous areas. The telemetering equipment operates on a 4-20 milliamp signal. The current for operating the field instruments has its power supply located at the compressor station. It does not need a power supply in the field.

This cable was buried on the pipeline ROW and plowed in after the ROW was completed. The cable is in about 1000-ft sections and above-ground splices are used on terminal boards which are later sealed and pressurized. The cable was buried because of severe weather conditions anticipated and the company did not feel that it could depend upon overhead line.

Thus, we have carried the story from storage, through the compressor station and on in to Atlantic's mainline to its major market-area customers. Just for the record, the flow from the opposite direction starts where the gas comes in off Atlantic's 26-in. system. At Files Creek compressor station, 28 miles west of Seneca, it will be discharged at 800 psig towards Seneca where it goes through a 10-in. jumper line, into WB-3, to Terra Alta station and on into the storage field. EIM valve operators on the jumper line will be controlled at Seneca from inside the main building there.

But, the story is in the flow the other way—"from the wellhead to the burner tip"—even if it is in miniature. ■

Combined Construction Costs, WB-3 & X-76-M-1

(as obtained from FPC application)

Backfilling, repairing fences, and cleaning up ROW	$ 113,800
Bending, welding, laying and lowering pipe	500,700
Blowing, testing and purging	11,400
Coating	295,800
Cost of Survey	17,200
Direct Labor	86,100
Excavating and grading trench	568,900
Gas Cushion and purging	8,600
Grading and clearing ROW	318,600
Interest and overhead	73,300
Line pipe	1,473,500
ROW damages	89,000
Stores, hauling and miscellaneous	225,300
Unloading, hauling, and stringing pipe	125,200
Valves, fittings and miscellaneous material	232,700
X-ray, gate settings, extra work, concrete and sleeves	74,100
TOTAL	$ 4,214,200

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Texas Eastern's Rayne field

Gas processing plant goes on-stream

By ELTON STERRETT

Individual well separators for Rayne's 21 wells are centrally located at plant site (far left). To the right are low temperature separation and separator liquid flash units.

IN mid-1959 Texas Eastern Transmission Corp. bought the leasehold interests in the deep gas field near Rayne, La., with an estimated reserve of over 1 trillion cu ft. Producing from four sands, with a number of others proven but not now being produced, wells in the field average in depth from 13,500 to 14,000 ft. The gas is wet. But prior to completion of the Rayne processing plant, it was fed into the company's pipelines after customary separation.

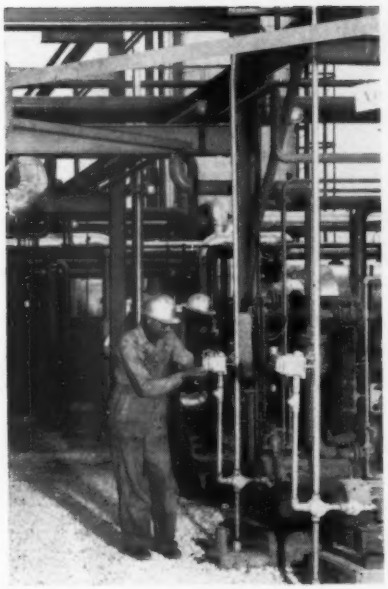
At the time of consummation of leasehold purchases, La Gloria Oil & Gas Co., a Texan Eastern subsidiary, began construction of a modern processing plant to recover additional hydrocarbon liquids and deliver acceptable pipeline gas to the transmission system.

Design capacity of the plant is 176 MMcfd of residue gas. Design recoveries at a residue gas volume of 155 MMcfd are 75 per cent propane, 95 per cent butane, and 100 per cent for heavier hydrocarbons. Costing about $3.85 million, design and construction were by Brown & Root Inc. of Houston.

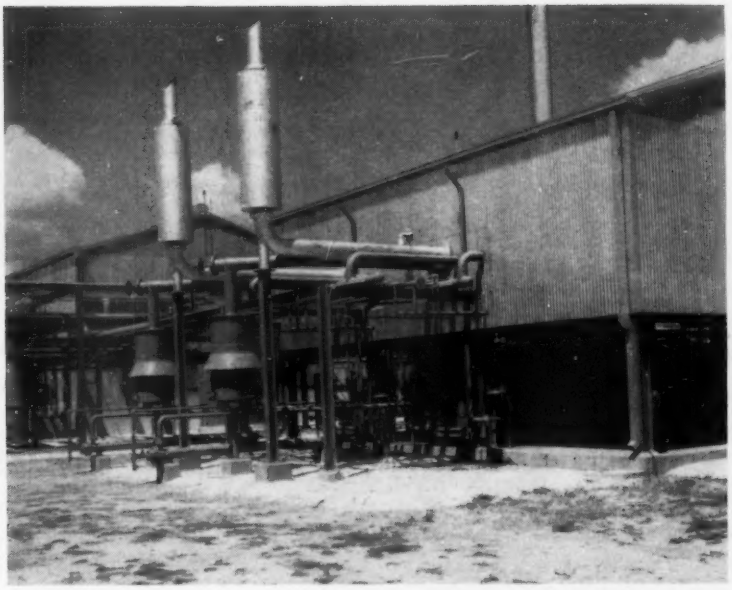
Each of the 21 producing wells in the field is connected to its individual high-pressure separator, located in a file along the edge of the plant site. Only chokes and flow-line heaters are located at the wellhead. Wellhead pressure averages 2900 psig. Measured for each well at this primary separation, the flow is combined and sent to four low temperature separators, operating at 1255 psig and 36 deg F. A 1250-psig flash tank takes liquids recovered here as well as flow from the individual well separators. Flash tank gas is combined with that from the main gas stream from the low temperatures separators and fed to the absorbers. The liquid from the flash tank is flashed again at 525 and a third time at 210 psig before being run to a 185-psig stabilizing tower. Fluid from this tower, having a vapor pressure of from 5.5 to 6.0 lb, is accumulated in tankage for delivery to either of two pipeline connections.

En route to the absorbers the gas stream is passed through heat exchangers where the temperature is dropped from 75 deg F to 55 deg F, after which glycol is injected to prevent the formation of hydrates and a second chiller drops the temperature to 40 deg. The rich glycol is removed from the stream by a scrubber, downstream from the chiller.

The lean oil stream is presaturated with residue gas from the absorbers, operating at a pressure of 1235 psig. After the mixing operation, the stream is chilled in a propane chiller to bring the temperature to 40 deg F and separated in a presaturator tank. The cold residue gas thus obtained is passed through the feed gas-residue exchanger, through a scrubber, and then is metered and delivered to Texas Eastern's system



Operator starts motor for stabilizer reflux accumulator.



This building houses the two I-R PSVG engines driving the 9-stage lean oil pumps. Building at left houses three engine-generator sets for plant power.

through a 22-mile 14-in. lateral. Four compressors are required to raise the pressure of the gas stream from that as it emerges from the presaturator tank to that received into the gas transmission system. They are: one Ingersoll-Rand model 10 cylinder KVG, 1000 bhp at 330 rpm; two Cooper-Bessemer 10 cylinder GMV, 1100 bhp at 300 rpm; and one Cooper-Bessemer GMV 10 cylinder unit, rated at 1000 bhp at 300 rpm.

Two Ingersoll-Rand 10 cylinder model PSVG engines, rated 680 bhp at 514 rpm, drive the two 9-stage lean oil pumps. Three Ingersoll-Rand 6-cylinder model PSVG, rated 408 bhp at 514 rpm, are direct-connected to 280 kw, 3-phase, 60-cycle, 480-v a.c. generators for auxiliary power and lighting.

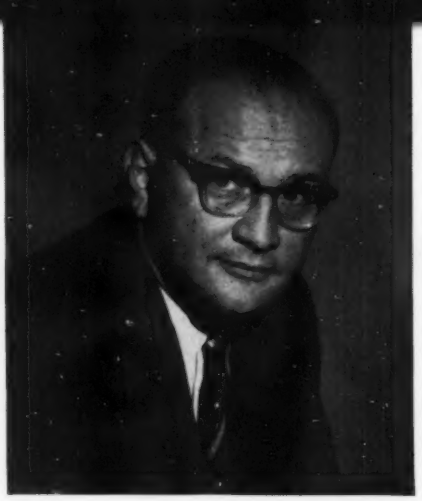
All nine gas engines use as fuel the overhead product from the de-ethanizer column, to which a portion of the overhead gas from the demethanizer reabsorber column may be added as required. This fuel not only supplies the gas engines, but also the plant heaters, still reboil heaters, and the steam boiler furnishing steam tracing and utility steam.

Two hydraulic turbines, each developing 100 bhp, serve to lower the pressure of the rich oil from the absorbers, the turbines being used as drives for the circulating water pumps at the cooling tower. The cold rich oil picks up heat in an exchanger through which is circulated the lean oil stream from the main lean oil pumps to the presaturators, and is then twice flashed, at 525 and 210 psig. Pressure drop between these two flash stages is through a third hydraulic turbine, developing 80 bhp to drive the still bottom reboil pump.

The rich oil stream from the 210-psig flash tank is heated by exchange with the hot lean oil flowing from the still to the main lean oil pumps, and then is piped to the demethanizing tower at 150 deg F and 165 psig. From the bottom of the demethanizer rich oil is pumped through a second rich oil-lean oil exchanger into a hot rich oil flash tank operating at 355 deg F and 175 psig. The vapors from this flash go back to the demethanizer to serve as stripping gas. The upper section of the demethanizing tower is a reabsorbing column. The rich oil is removed from the bottom tray of the reabsorbing column and pumped into the rich oil stream moving to the demethanizer from the 210 psig rich oil flash tank.

A side stream of lean oil is drawn off from the second stage of the main lean oil pumps, chilled to 40 deg F in a propane chiller, and pumped over the trays in the lower or demethanizing section to contact the vapors stripped from the rich oil.

The hot rich oil leaves its tank and is pumped to the still at 480 deg F and 95 psig after passing through another rich-lean exchanger. The lean oil from the still, now at 590 deg F, returns through a



Frank Friedli, *Manager,*
En-Tronic Controls Division,
The Cooper-Bessemer Corporation,
explains...

How Cooper-Bessemer En-Tronic® Controls operate compressor station 26 miles away

This electronic control at Robinson Station transmits the signals for completely automatic remote control of the Columbiana Station 26 miles away. It receives and charts data from that station and provides an alarm and lights to indicate conditions at the remote station. All this is carried by a single line.

A part of the gas stored for East Ohio's customers is handled by their Columbiana Station. Here, they have recently replaced a 40-year-old engine-driven compressor with a Cooper-Bessemer GMXD 660 hp Packaged Compressor and En-Tronic Control. This entire installation operates automatically by push-button control from the Robinson Station 26 miles away.

A single telephone line and tone equipment provide a series of frequencies which control all operations... automatic sequencing, system alarms, data reporting, opening and closing of plug valves in the station piping, instantaneous shutting down of compressor in case of failure of power or communications and automatic starting when services are restored, and all other control and regulating functions. The compressor is self-lubricating.

The Cooper-Bessemer equipment makes possible better utilization of skilled operators, greater dependability of control, and a considerable economy in operation.

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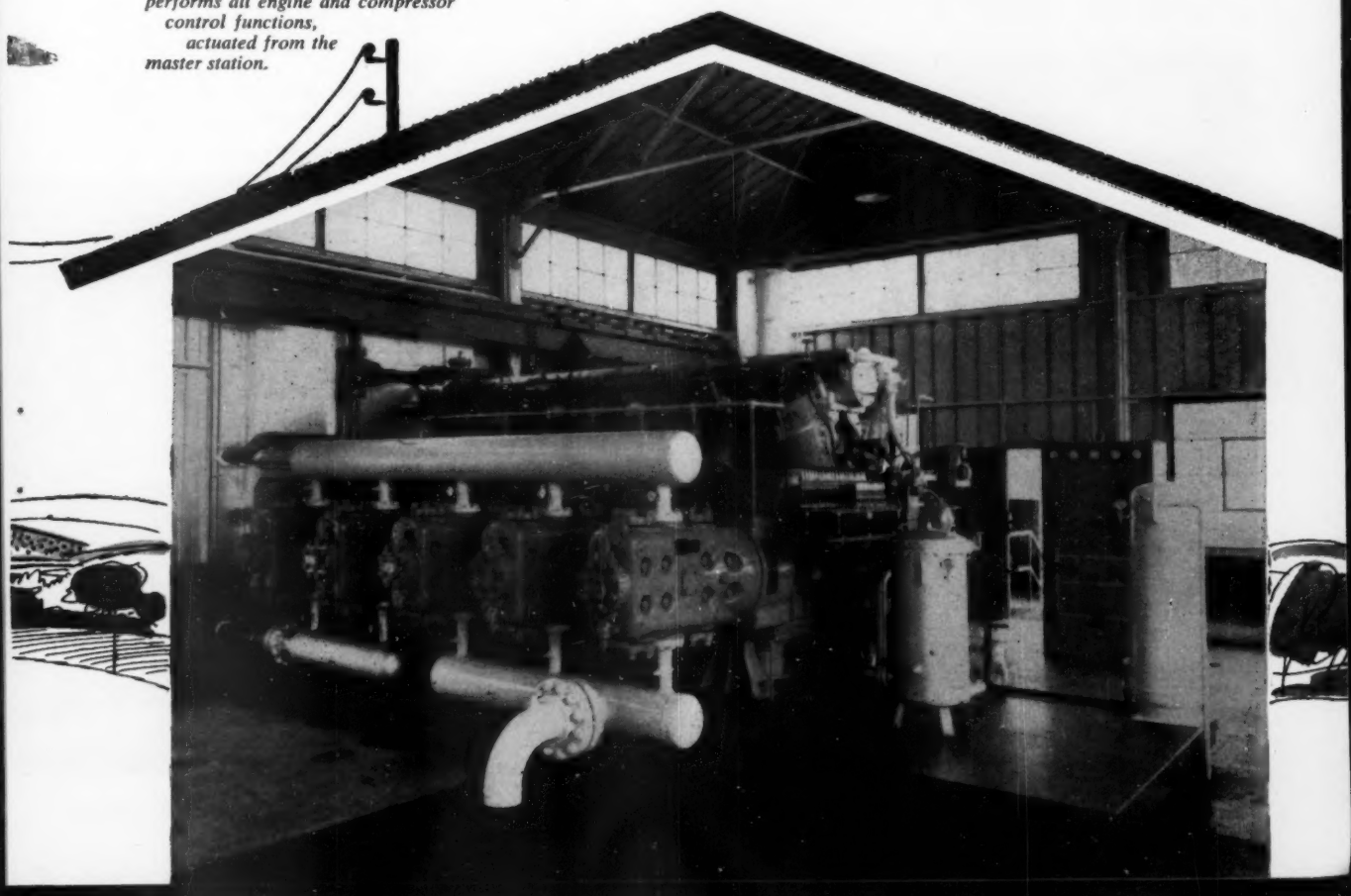
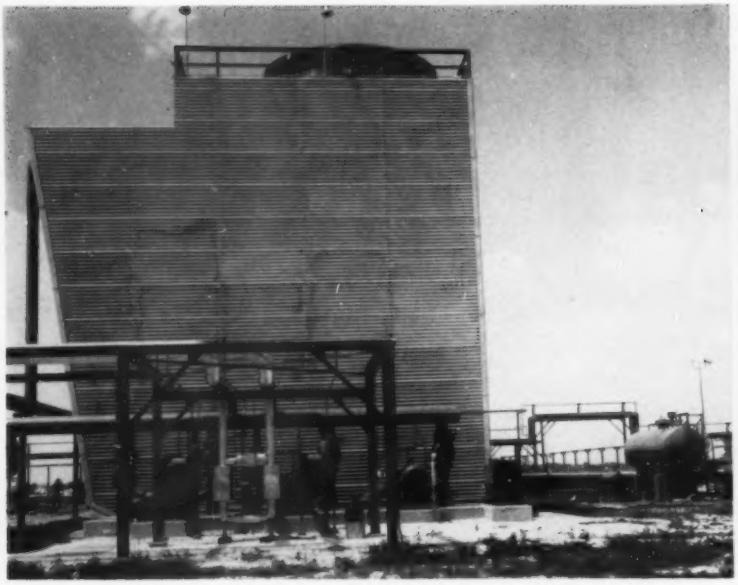
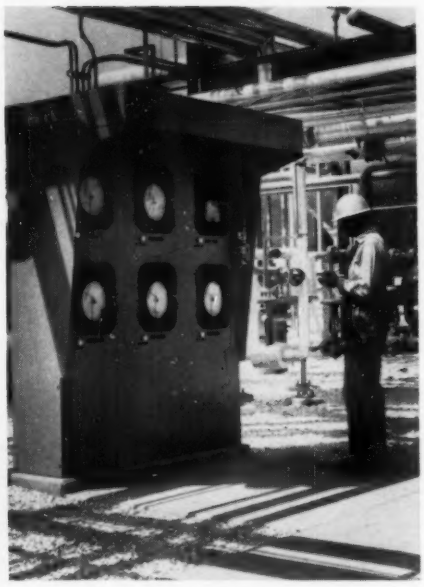
Foreground: Cooper-Bessemer GMXD-10 660 hp Packaged Compressor at Columbiana Station. Background: Cooper-Bessemer En-Tronic Control which performs all engine and compressor control functions, actuated from the master station.





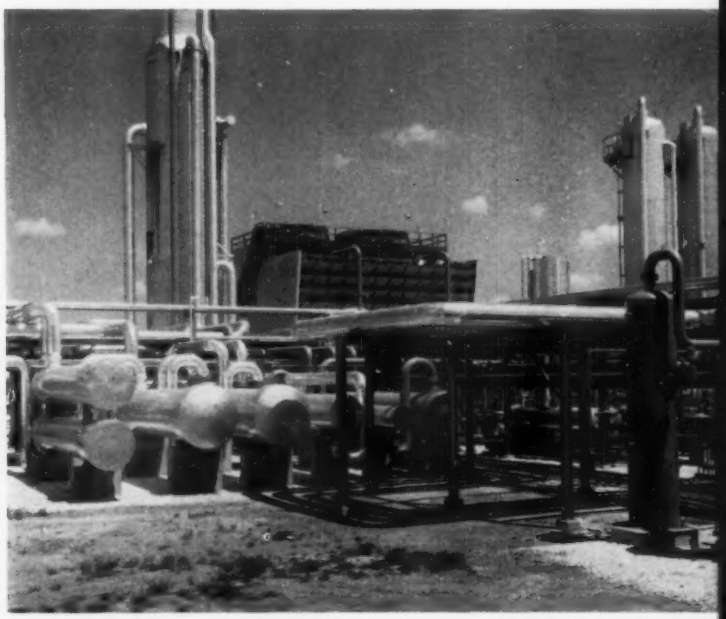
Cooling tower for process water. Served by insulating piping are two hydraulic turbines normally driving circulating pumps, with motor-driven unit at right. Fire pump rests on extension of tower foundation.

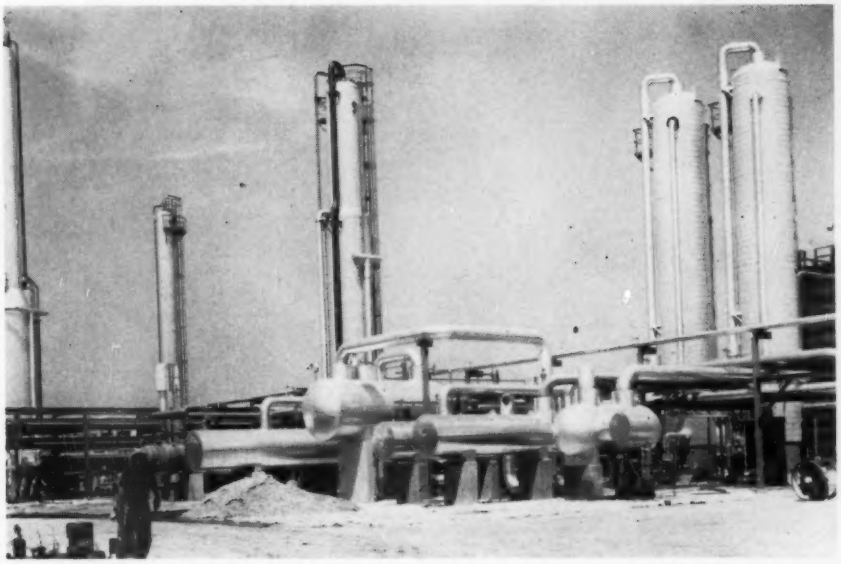


Operator checks and records chart readings at a control panel for the stabilizer and de-ethanizer units.

Vessels installed at Rayne include (left to right) de-ethanizer, stabilizer (foreground), still (background), demethanizer, and a pair of absorber units.

Bank of heat exchangers—one of many throughout the plant—flanked by some of the intricate piping for the heat interchange, and with still and cooling tower in the background.





Workman services fire extinguisher equipment near the gas and oil chilling and presaturating equipment (foreground). In the background are the de-ethanizer, still, and absorbers.

series of rich-oil/lean-oil exchangers and a final water-cooled exchanger to enter the main lean oil pumps at 95 deg F. Heat at both still bottom and fourth tray below the feed tray is added through withdrawing a portion of the oil from each point, passing it through direct-fired heaters to bring its temperature to 595 deg F, and returned at the point of withdrawal. Neither outside stripping steam or stripping gas is employed for stripping the absorber oil.

The overhead product from the still, at 220 deg F, is passed in turn through the reflux condenser, a flooded still reflux accumulator where reflux is withdrawn at 110 deg F, and finally through a product cooler for further cooling and condensation at 95 deg F before being pumped to the still product accumulator at 80 psig. The liquid is pumped from this accumulator at a pressure of 175 psig at the same time that the uncompressed vapors are condensed, and the two phases recombined at this pressure, then condensed at 100 deg F, and sent to the raw make tank.

A de-ethanizing column, operating at 465 psig with a bottom temperature of 220 deg F and a top temperature of 70 deg F, receives the raw make. A propane chiller condenses the reflux while the overhead vapors go to the plant fuel system. The bottom de-ethanized product, with a vapor pressure of 120 psig at 100 deg F is metered directly into two pipeline connections. The bottom product is utilized in a heat exchanger to condition the feed to the de-ethanizer.

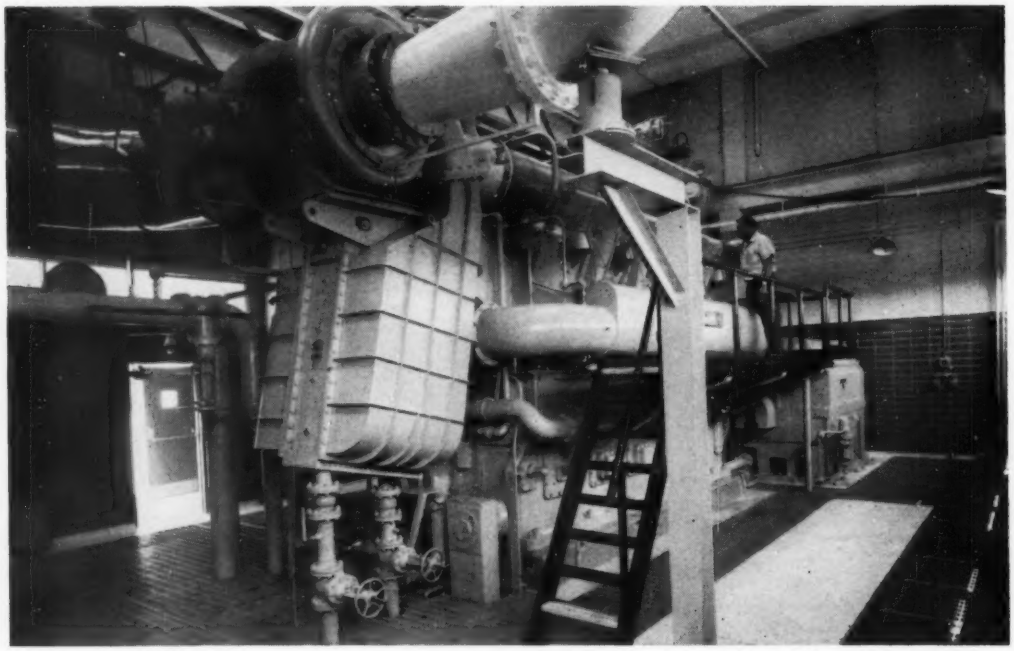
The propane used as refrigerant throughout the plant cycle is compressed as a portion of the load carried by the four compressor units repressuring the main gas recovery for delivery to the pipeline system. Fixed capacity cylinders on three units and a fixed clearance pocket on the fourth provide the propane compression required. Horsepower requirements are such that three units can carry the load of 150 MMcf and the required propane compression.

A single induced draft, cross-flow cooling tower handles the process cooling water, circulation being through pumps driven by the hydraulic turbines mentioned earlier. A third pump, motor-driven, serves as stand-by. The tower basin carries water to a depth of 5 ft, this serving as emergency water supply in case of disruption of the water make-up service. A gasoline engine-driven fire pump also draws on this reservoir for fire-fighting as required.

Jacket cooling water for all compressors is through a closed system with a four-bay, two-fan, aerial cooler with bypass temperature control of water returned to the engines. Rain water is used for makeup, being collected from run-off from the compressor building. The rain water storage tank is corrosion inhibited, and is equipped with an automatic level controlled device for maintaining required level in the cooling water surge tank.

The plant is designed to recover 28 bbl of a de-ethanized propane, butane, condensate mix and 58 bbl of 5.5 to 6.0 psi vapor pressure separator liquid per MMcf of residue gas.

A force of 20 men operates the plant, including one plant superintendent, one operations foreman, four operators and four operators' helpers (one each per shift), two instrument men, two mechanics, two laboratory men, one office clerk, and three roustabouts. ■



Industry's first combination of a 2-cycle gas engine driving a centrifugal pipeline compressor. V-engine was designed for maximum compactness and dependability in a pipeline-type engine.

2-cycle-centrifugal combination in action

LATE in August, representatives from gas transmission and engineering companies saw in action the industry's first combination of a 2-cycle, V-type gas engine driving a centrifugal pipeline compressor.

The scene was the Hampshire, Tenn., station of Columbia Gulf Transmission Co.'s new automated pipeline. Sponsors of the demonstration were Columbia and Clark Bros. Co., one of the Dresser Industries.

Main elements of the installation are a Clark 2-cycle, turbocharged, V-type gas engine rated at 4000 bhp; a 24-in. x 24-in. Clark centrifugal compressor; and a Westinghouse speed-increasing gear of lock-train design.

This combination makes several firsts:

—The first time a 2-cycle engine has been teamed with a centrifugal compressor on a natural gas line.

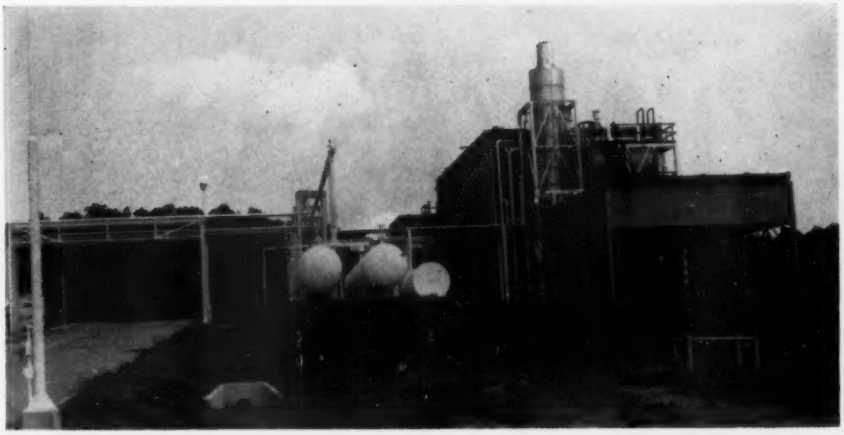
—The first of a series of extremely large Clark 2-cycle engines. (The initial unit, a 10-cylinder engine rated at 4000 bhp, will be followed by 12- and 16-cylinder machines rated at 4800 and 6400 bhp respectively.)

—The first application of the Clark centrifugal compressor with an engine driver. (It has been in use for nine years with gas turbine and electric motor drivers.)

—The first use of a gear of this configuration in natural gas transmission. (It has had long previous use in ships and locomotives.)

The demonstrations were held on alternately successive days during the week-long period. First on the program was a tour of Columbia Gulf's main gas control center in Nashville, where Sy Orlofsky, Columbia vice president, explained the operation of the company's pushbutton pipeline. Columbia has pioneered in compressor station automation to reduce natural gas pipeline operating costs. Including the new station, Columbia now has in operation six automatic and five semi-automatic compressor stations.

The second phase of each demonstration took the visitors to the Hampshire station where they saw the engine and compressor in operation under full load. The installation was designed cooperatively by Clark,



Columbia Gulf's new pipeline booster station at Hampshire, Tenn. Installation is designed for completely unattended operation with remote control from gas control center in Nashville.

Columbia Gulf, and Gulf Interstate Co.

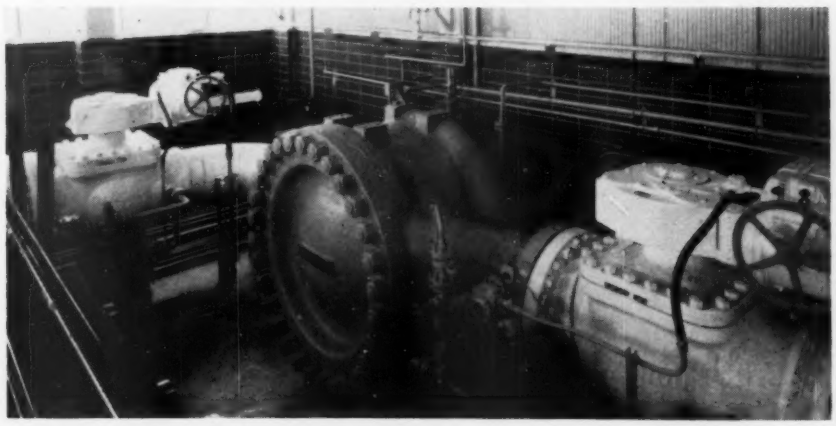
The Clark engine, Model TPV, is a 17-in. x 19-in., bore-and-stroke machine designed for a variable speed range of 250-360 rpm. The 10-cylinder unit at 330 rpm is rated at 4000 bhp with a bmep of 110 psi. It is equipped with a constant pressure turbocharging system which helps achieve a thermal efficiency of about 40 per cent. The engine is unusually quiet and compact for its power output. Basic purpose of 2-cycle V-type design is to meet the pressing need for maximum availability and dependability in a pipeline-type engine.

Clark's single-stage centrifugal compressor incorporates a removable volute (internal assembly). Thus the same machine can handle high head-low flow conditions when a pipeline is first opened and later can be adapted for low head-high flow conditions with the insertion of new internal components. The pitch of the guide vanes also can be varied to maintain peak efficiency over a wide range of operating conditions. The speed of the engine in this arrangement can be varied from 270-360 rpm. Accordingly the speed of the compressor (through the speed increasing gear) varies from 4120 to 5500 rpm. Capacity ranges from 7500 to 15,000 cfm, depending on demand and pressure conditions within the line.

The speed increasing gear, which has a ratio of 15.3:1, features input and output shafts on the same center line. The input shaft turns the low speed gear. At either side of the low speed gear are twin low speed pinions which turn dual quill shafts to twin high speed gears, which, in turn, drive the high speed pinion and output shaft.

The installation is presently running on local automatic controls, but is designed ultimately for completely unattended operation with remote control from Nashville.

Housing the unit is a building incorporating a new design concept. Three sides feature acoustical aluminum sandwich-type paneling being used in the industry for the first time. The engine and compressor room are separated by a fire wall. All engine automatic controls and auxiliary equipment are contained in a separate room. In addition, the engine's oil piping is aluminum. This has never been done before on a natural gas prime mover. ■



Clark's 24-in. x 24-in. pipeline centrifugal compressor at Hampshire.

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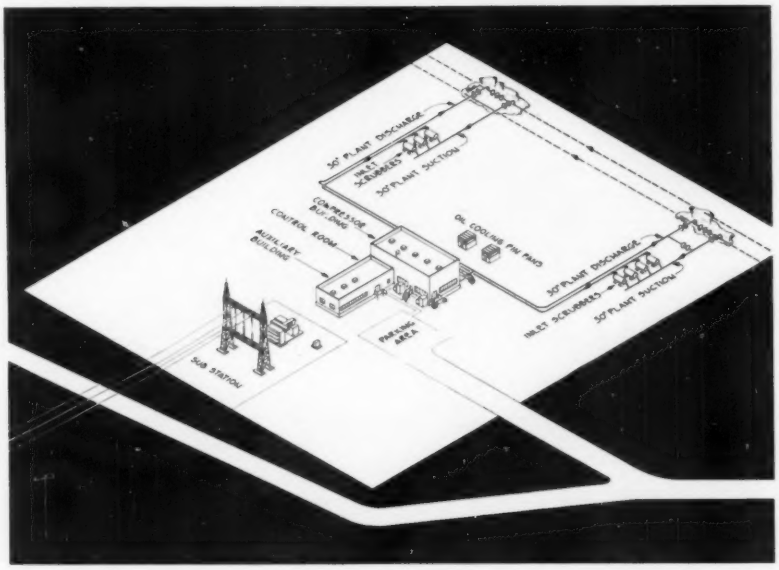


El Paso adds

An electric motor drive for a centrifugal compressor

By JAMES R. HOFFMAN
El Paso (Texas) Natural Gas Co.

IN 1957, an increase in our gas load to our California customers made it necessary to add another compressor station to our northern pipeline system, near Seligman, Ariz. This was, of course, in addition to other facilities along the northern system.

After studying and comparing the two types of compressors and three types of prime movers that were available to do the job, we decided to proceed on the basis of electric-motor driven centrifugal compressors. This decision was reached on the basis of economics, equipment availability, construction time, reliability of power sources, and the adaptability to remote control under unattended or semi-unattended conditions. Even though an electric motor-driven centrifugal was the answer for us at this location, it might not have been under a different set of circumstances.

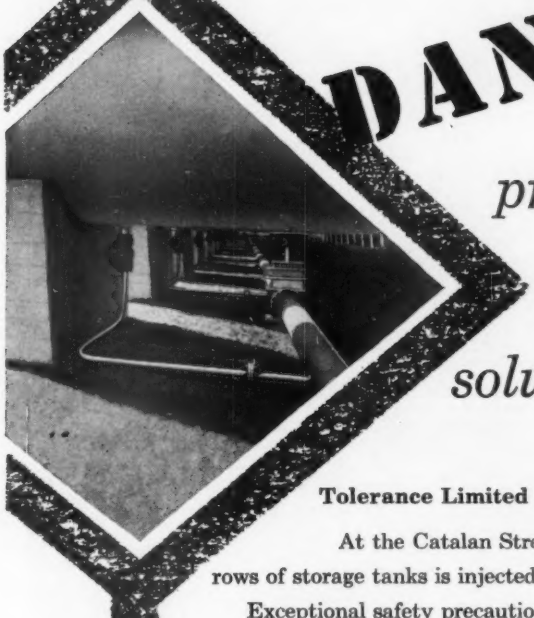
There are five major factors that need to be carefully considered prior to making a motor selection of this type:

1. Motor horsepower required: The individual motor horsepower is determined by: (1) the total horsepower required by the station; (2) the maximum allowable inrush current during starting which is specified by the power company; and (3) the individual compressor requirements. For the Seligman station, this horsepower was limited primarily by the power company. It was not able to start a motor across the line in excess of 5000 hp without reducing the line voltage an excessive amount.

2. Motor torques: These are determined by the compressor and gear manufacturer. In most cases, a 40 per cent starting torque with a 60 per cent pull-in torque and 150 per cent pull-out torque is sufficient when starting under a no-load condition.

3. Type of motor (synchronous or induction): This selection can be made solely on the basis of economics. All things being equal, the slightly higher efficiency of the synchronous motor can sometimes be the determining factor.

4. Type of motor enclosure (explosion-proof, forced-ventilated, or weather-protected): In general, the atmosphere surrounding the compressor is considered semi-hazardous. Consequently, the motor must be suitably enclosed. At present, explosion-proof motors are only available up to 3000 hp in the induction class. Forced ventilation is probably the most predominant practice for indoor installations of synchronous motors in a compressor building. We feel that if the unit



DANGER!

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solution: **SHOP FABRICATION BY MIDWEST!**

Tolerance Limited to 1/16" on Inlets to 500-Ft. Header.

At the Catalan Street Station of Laclede Gas Company, St. Louis, propane from rows of storage tanks is injected into the natural gas supplied to Laclede customers. Exceptional safety precautions precluded field fabrication and welding on piping to connect natural gas lines and the propane tanks.

Instead, Midwest shop-fabricated the propane headers in lengths up to 70 feet, complete with nozzles and tank outlet piping for flanged connection to each tank. These connecting lines had to be - and were - accurate in alignment within a tolerance of 1/16".

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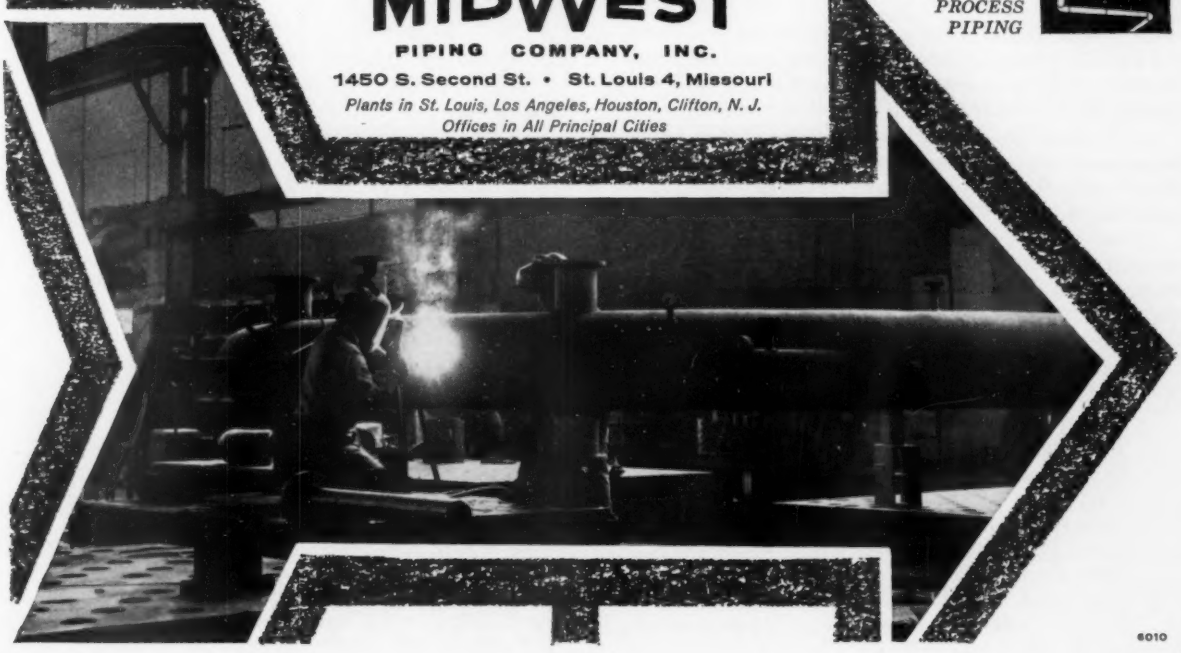

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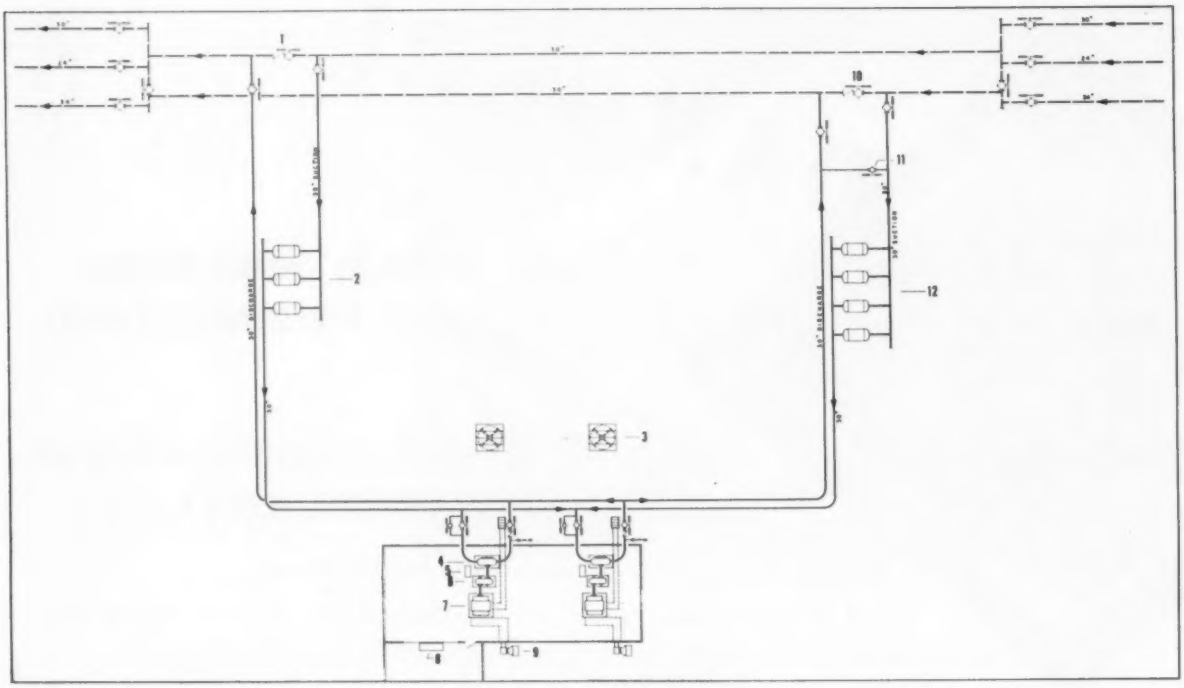


Fig. 1. Piping within the station.

1—Station by-pass valve
2—Inlet scrubbers
3—Oil cooling fin fan
4—Compressor
5—Compressor console
6—Speed increaser
7—5000-hp motor
8—Operating console
9—Forced air fan
10—Station by-pass valve
11—Surge control valve
12—Inlet scrubbers

were located outdoors and subject to adequate natural ventilation, a weather-protected motor could be used, whether it be synchronous or induction, and still not constitute any hazard to the installation.

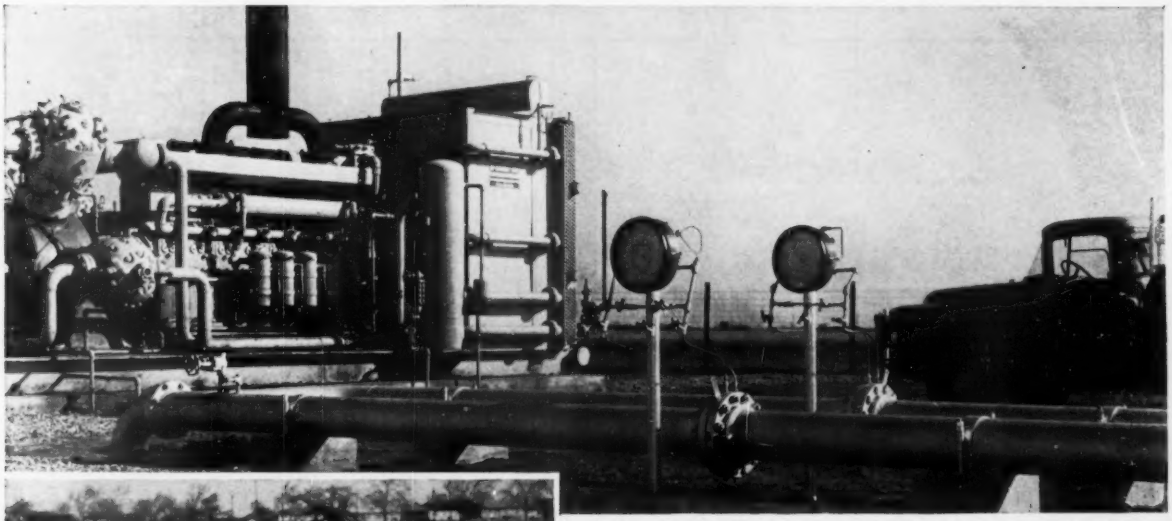
5. The motor rpm: The speed of the motor is again an economic selection based on the lowest cost motor-gear combination to obtain the required centrifugal compressor speed.

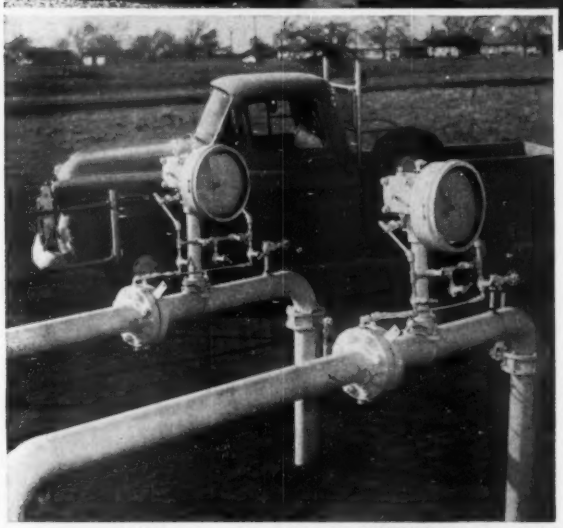
After discussions with other companies involved, namely the power company and compressor, gear, and motor manufacturers, we selected the following motor for use at Seligman:

Synchronous motor—5000-hp, 4000-v, 3-phase, 60-cycle, 1200-rpm, unity (1.0) p.f., with the following features:

1. The motor is designed for continuous non-injurious heating at 5750-hp (NEMA 1.15 service factor) and is braced for full voltage starting.
2. Armature windings and armature connections have Class A insulation. Field windings have Class B insulation.
3. The locked rotor inrush at full rated motor terminal volts is not more than 450 per cent of full rated load kva.
4. With rated motor terminal volts, the motor torques are as follows: 40 per cent starting, 60 per cent pull-in, and 150 per cent pull-out.
5. Separate 125-v, d-c excitation is used in the form of motor generator sets.
6. Each motor bearing is flood-lubricated.
7. It has six winding temperature detectors.
8. Each motor bearing has a bearing temperature relay in an explosion-proof (Class I, Group D) enclosure.
9. Three-phase, 440-v space heaters are included for protection of the motor when not in use.
10. The motor is constructed for ventilating air intake and discharge at the bottom of the motor.

At the point on the mainline where Seligman station is located, there are three pipelines, one 24-in., one 30-in., and one 34-in. The three lines manifold together at each side of the station and only two 30-in. lines were run across the plant site. *Fig. 1* shows the piping within the station. The piping was arranged in this manner in order to minimize pressure drop within the station and also allow us to pump on a single pipeline when necessary. The station piping is sized and located to accommodate an ultimate of six





Foxboro Diaphragm Meters on gas well head measurements at Sunray Mid-Continent's Moore, Oklahoma field. Meters return to zero instantly when flow stops — have no ambient temperature effects, even though temperatures have ranged from −9°F to +105°F.

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. . . reports H. H. (Pat) Everett
Sunray Mid-Continent Oil Co.

Fastest zero return of any dry meter on intermittent gas flows. That's just one reason why Sunray Mid-Continent Oil Co. finds the Foxboro Type 37 Diaphragm Meter perfect for gas wellhead flow measurements.

Sunray currently has 47 Diaphragm Meters in operation on gas separator and compressor stations in the Oklahoma City district, with 13 more due to be installed shortly.

District Superintendent H. H. (Pat) Everett also reports that his Diaphragm Meters have never needed calibration since they were installed. And they're completely free from zero drift and ambient temperature effects . . . resulting in the highest sustained accuracy of mercury-less gas flow measurement. No wonder Sunray says the Type 37 outperforms all other dry flow meters!

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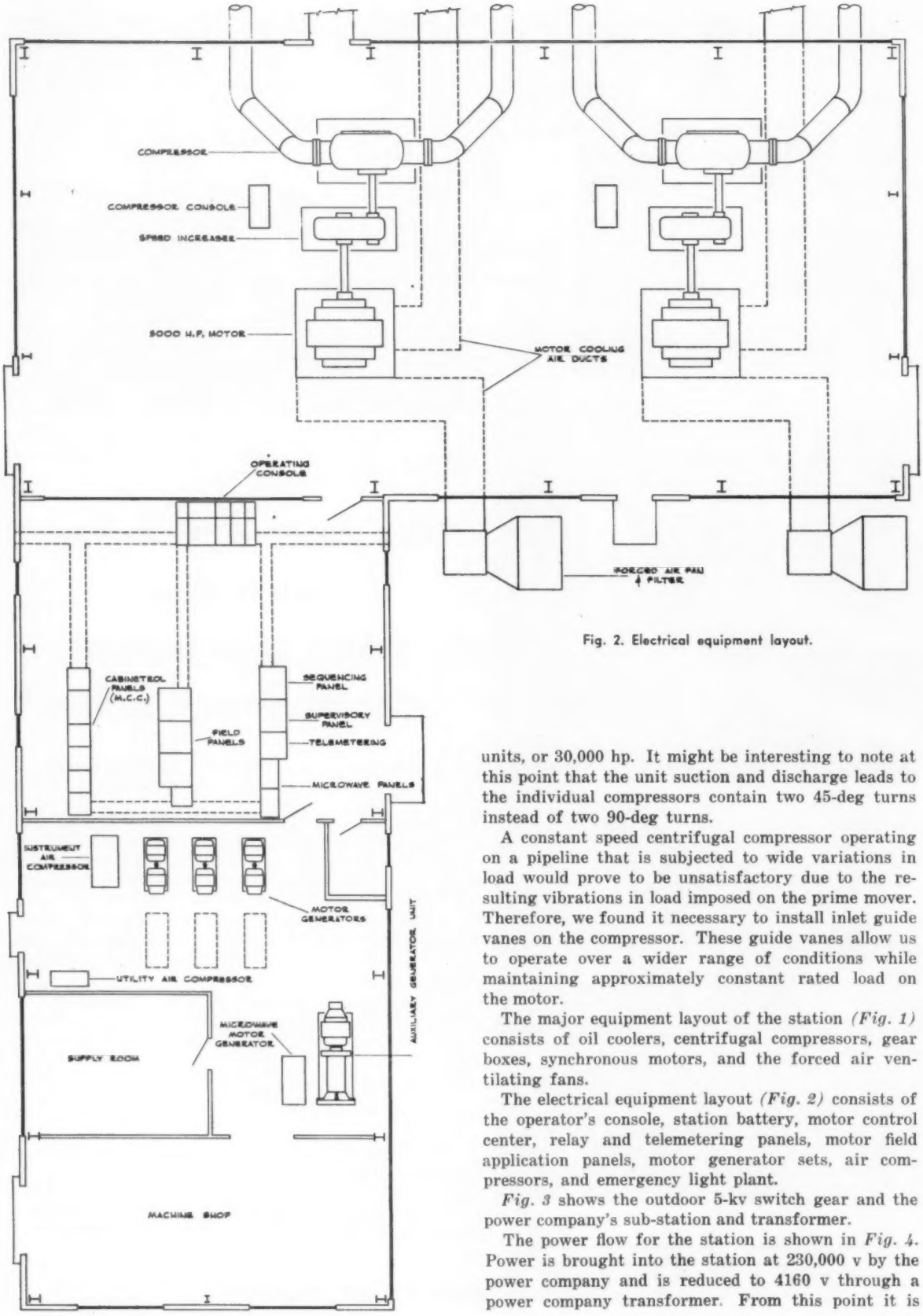

Fig. 2. Electrical equipment layout.

units, or 30,000 hp. It might be interesting to note at this point that the unit suction and discharge leads to the individual compressors contain two 45-deg turns instead of two 90-deg turns.

A constant speed centrifugal compressor operating on a pipeline that is subjected to wide variations in load would prove to be unsatisfactory due to the resulting vibrations in load imposed on the prime mover. Therefore, we found it necessary to install inlet guide vanes on the compressor. These guide vanes allow us to operate over a wider range of conditions while maintaining approximately constant rated load on the motor.

The major equipment layout of the station *(Fig. 1)* consists of oil coolers, centrifugal compressors, gear boxes, synchronous motors, and the forced air ventilating fans.

The electrical equipment layout *(Fig. 2)* consists of the operator's console, station battery, motor control center, relay and telemetering panels, motor field application panels, motor generator sets, air compressors, and emergency light plant.

Fig. 3 shows the outdoor 5-kv switch gear and the power company's sub-station and transformer.

The power flow for the station is shown in *Fig. 4*. Power is brought into the station at 230,000 v by the power company and is reduced to 4160 v through a power company transformer. From this point it is

64 men on a standard length of pipe

Pipe shown is: 11' O.D. X .203 wall, grade X-52.

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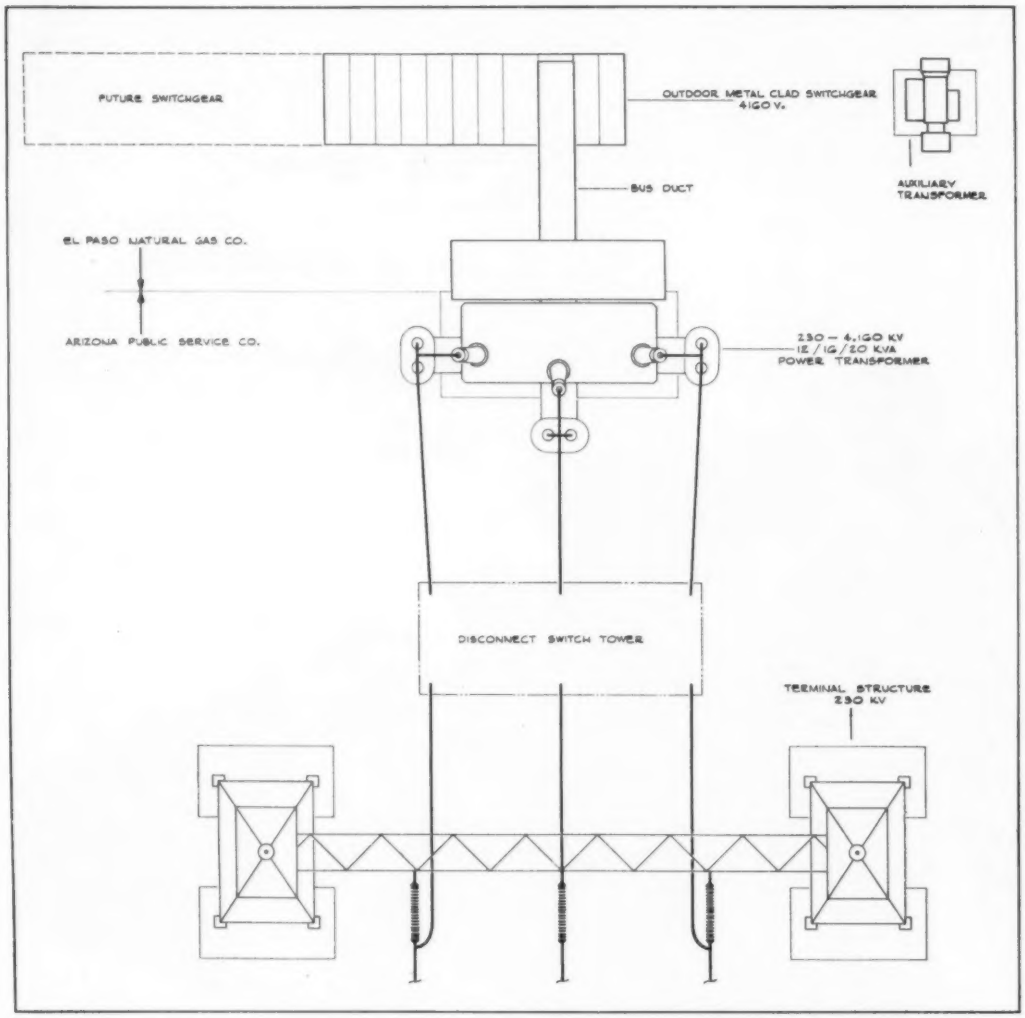
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OUTDOOR METAL CLAD SWITCHGEAR 4160 V.
AUXILIARY TRANSFORMER
BUS DUCT
EL PASO NATURAL GAS CO.
ARIZONA PUBLIC SERVICE CO.
230 – 4.160 KV 12/16/20 KVA POWER TRANSFORMER
DISCONNECT SWITCH TOWER
TERMINAL STRUCTURE 230 KV

Fig. 3. Outdoor 5-kv switch gear and power company's sub-station and transformer.

carried to the station switch gear bus by means of a bus duct for distribution to the various loads. Breaker No. 1 feeds a grounding bank of transformers which is used to limit ground currents and provide us with an indication of a grounded phase. Breakers No. 2 and 4 feed the 5000-hp motor bus. Breaker No. 3 feeds the station 4160 to 440-v transformer, which, in turn, feeds the station auxiliary equipment through the motor control center. The power company's present transformer with the addition of fans is sized to accommodate four motors. In the event the station installation exceeds four motors, the power company will install a second transformer. The dotted lines on *Fig. 4* indicate how this power will tie to the existing bus work.

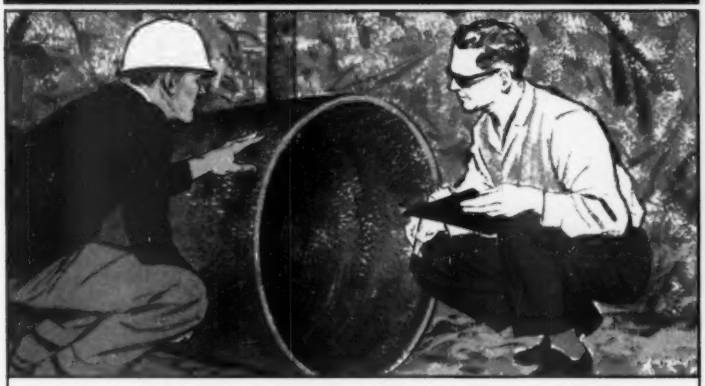
The operating procedures for this station are extremely simple and consist of merely pressing buttons to obtain the required results. After station circuit breakers and automatic controls are placed in the automatic position, an operator has full control of the station from either the console at Seligman station or from a remote console located 30 miles away. Signals from the remote station are transferred over a microwave system with only one repeater between the two sites. The operator at either location has full control over all station valves only after the station piping is pressurized.

With station piping pressurized, the only operation that an operator at Seligman or Williams need perform to place a unit on the line is press the start load button for the correct unit. This in turn will automatically purge and pressurize the compressor case, start the motor, and complete the necessary valving to load the compressor. *This entire operation takes only*

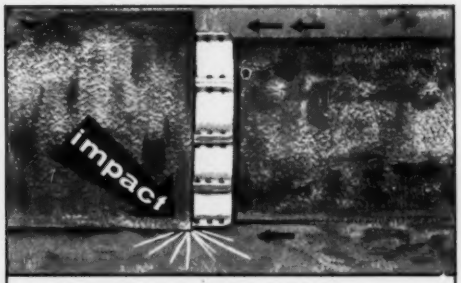
Fig. 4 is on page 172; text continues on page 174.

NEWS FROM DOWN THE LINE!

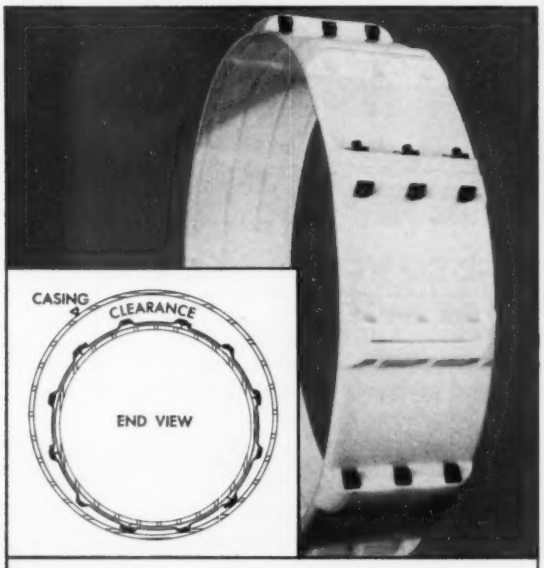
WmSON BIG-INCH M-2 THINSULATORS® MEET RUGGED TEST IN NEW JERSEY TURNPIKE CROSSING



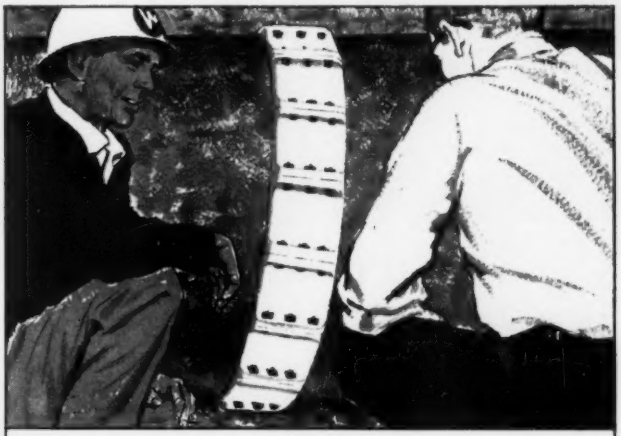
❶ "We'll pull the 36" drag section through this 275' casing. The casing has a slight dog-leg in the center which will make the pull a really tough test of the THINsulators."



❷ "M-2 THINsulators are high-density polyethylene products, resistant to fracture under tremendous impact. Most other plastic insulators are fiberglas reinforced polyesters that don't have the impact resistance, so breakage rates are high."



❸ "The high density polyethylene gives the M-2 such strength it can be made more compact than other insulators, allowing more clearance. It's flexible, so it conforms to the pipe for uniform coating loading . . . and the low coefficient of friction makes it slide like it's greased."



❹ "The tremendous force of the pull caused the lead THINsulator to absorb most of the shock. It twisted slightly but remained intact. All hands agree this is the best plastic casing insulation they have used."

❺ "Consider the economy of M-2 THINsulators. They cost no more than other plastic insulators, and breakage is **practically unknown.** Bend 'em, beat 'em, you can't break 'em."

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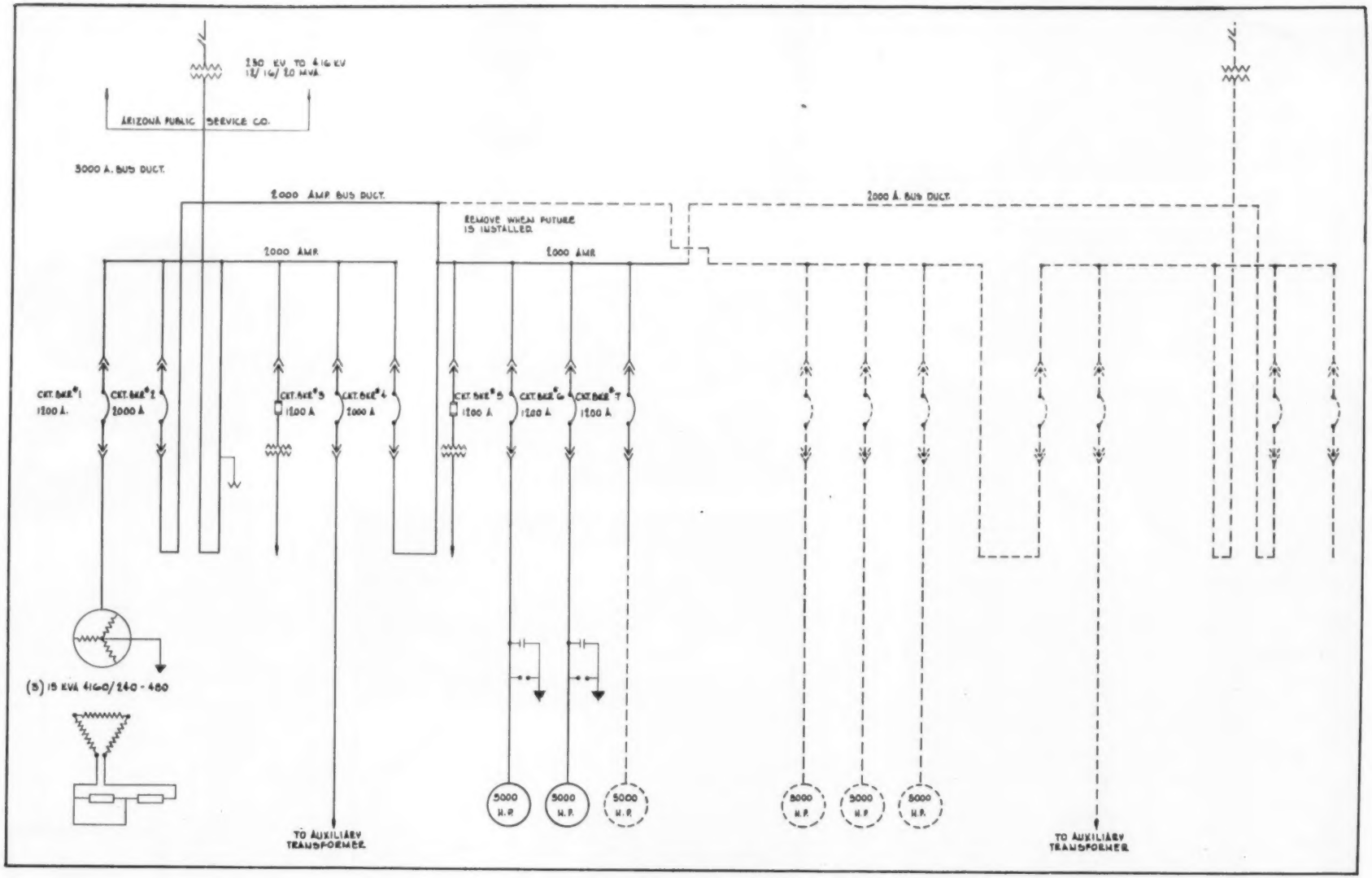

Fig. 4. Station's power flow.

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four and a half minutes. The operator may then, at his discretion, close the station block valve from either console. On a station shutdown, the units will go down in the reverse sequence. The station valves will close and the station block valves will automatically open, thereby permitting gas in the mainline to bypass the station.

As yet we have not accumulated all of the final costs for this station. However, preliminary data indicated that they will be fairly close to the following:

Major equipment	$1,172,000
Labor & misc. supplies	1,019,000
Water supply system	53,000
Camp & roads	375,000
TOTAL	$2,619,000 or $262 per hp

Based on the above initial costs, our estimates indicate that when this station contains the full 30,000 hp for which it is designed, the overall cost per hp should be approximately $180.

The station has not been operating long enough for us to arrive at any firm operating and maintenance costs. The following costs were used by us for estimating purposes and were confirmed by other gas transmission companies employing similar types of prime movers.

Division office	$1.90 per hp-yr.
Operating	
Labor	1.20 per hp-yr.
Supplies & expenses (Exc'l fuel)	0.41 per hp-yr.
Maintenance	
Labor	0.60 per hp-yr.
Supplies & expense	0.60 per hp-yr.
TOTAL	$4.71 per hp-yr.

The annual power bill for this station when operated at full load (10,000 hp) at a 90-per cent load factor, will be $598,842, or 8.89 mills per kwh. This appears to reflect a rather high operating cost. However, when it is combined with the relatively low initial station cost, the total annual expense is equal to or lower than other types of installations.

By actual tests performed on the station, the efficiencies at full load are as follows:

Motor	98 per cent
Gear	95.5 per cent
Compressor	82 per cent
Overall	76.74 per cent

The only one of these efficiencies that will vary appreciably under other loads is the compressor.

Even though the Seligman station has been operating for only a short period of time, operating personnel and management are very well pleased with the installation. The oustanding feature of the installation is the ease of operation. ■

This article is adapted from a talk presented at the Jan. 7, 1960, meeting of the California Natural Gasoline Association in Los Angeles.

Building compressor plants in Lake Maracaibo

By W. F. GANSKOPP

Gas Section Supervisor, Production Department
Creole Petroleum Corp., Caracas, Venezuela

CREOLE Petroleum Corp., an affiliate of the Standard Oil Co. (N.J.), owns and operates three large gas compressor plants in Lake Maracaibo, Venezuela. A fourth such plant in the same general area was placed in operation about mid-year 1960.

These are called "conservation plants" since one of the purposes which they serve is to conserve, for future effective use, gas produced in association with oil recovered from Creole's concessions in the prolific Bolivar coastal region. The primary purpose of these plants, however, is to increase the recovery of oil from reservoirs into which gas is injected. By maintenance of pressure through injection of gas, reservoir producing capacity is maintained at a high level. Also, production by natural flow is continued through most of the life of the field, thus obviating the need for gas lift, pumping, or other artificial lift methods. Ultimate recovery of oil from the reservoirs into which gas from these plants is injected will be increased by an estimated 1 billion bbl. This represents an increase of more than 35 per cent over recovery by natural depletion methods.

In 1951, industrial use of the gas turbine was in its infancy and a centrifugal compressor had not yet been designed for compression of gas to pressures above 1000 psi. It was then that Creole decided to construct its first gas turbine-driven centrifugal compressor plant in Lake Maracaibo. This decision was reached after a compressor manufacturer undertook to design and build a centrifugal compressor which would meet Creole's requirements. Also a thorough study by Creole's engineers of possible alternatives reached these conclusions:

1. It was fundamentally cheaper to build and operate a compression plant supported by a pile foundation platform offshore in Lake Maracaibo than to deliver gas from the lake area to a shore compression

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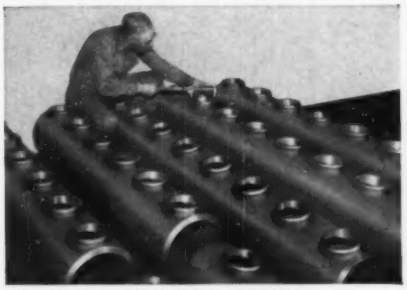

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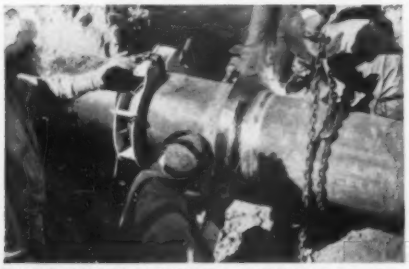

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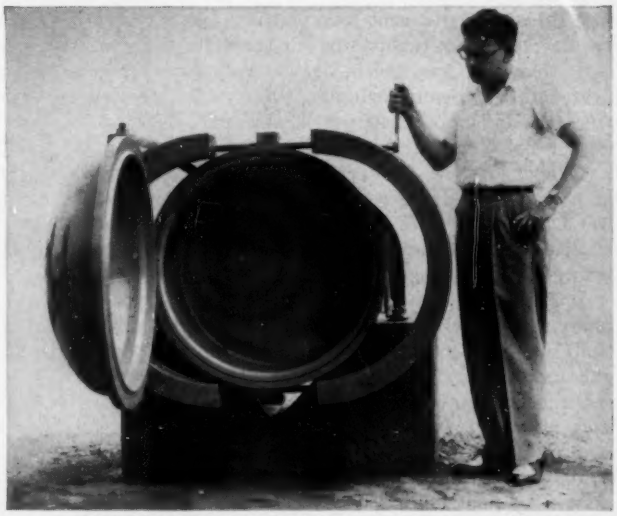

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plant and return compressed gas to the lake for its injection into reservoirs.

2. The unbalanced forces inherent in reciprocating machinery could conceivably impair the stability of a pile-supported platform located almost 100 ft above lake bottom.

3. About 35 per cent less platform area would be required for gas turbine-driven centrifugal compressors than for gas engine-driven reciprocating compressors. When considering that deep-water platforms were costing about $40 per square foot, this was a major cost item.

4. The cost per horsepower for purchase and installation of gas turbines and centrifugal compressors was competitive with that of gas engine-driven reciprocating compressors and electric motor-driven centrifugal compressors.

5. The cost of operating and maintaining gas turbines and centrifugal compressors would be substantially less than that of other combinations of drivers and compressors.

On retrospective examination of the first plant's cost and performance, these conclusions were substantiated. This is evidenced by the fact that two similar plants have since been built and still another is being constructed.

Design of Conservation Plant Tía Juana One and its attendant gathering and injection facilities was begun in September 1952. Construction was completed in August 1954 and, after two months of trials, the plant was put in continuous operation on Oct. 3, 1954.

This plant is built on a pile foundation platform in 62 ft of water, six miles off-shore in Lake Maracaibo. This location is approximately the geographic center of the separator flow stations which supply gas feed to the plant.

Original design of the plant and its facilities was based upon an injection requirement of 137 MMcfd into oil sands of Eocene age in the LL-370 Area. Due possibly to the fact that this plant was the first of its kind, liberal safety factors were provided all along the line. In fact, in actual performance, the plant has been capable of delivering far in excess of its design capacity. This surplus capacity has been a blessing in disguise since it was found after gas injection was initiated that communication existed between the reservoir into which gas was being injected and an adjacent block having the same sand characteristics. Thus, the boundaries of the pressure maintenance area were extended, adding appreciably to the volume of oil which could be recovered by injection of gas.

Original design of the plant was based upon receiving 155 MMcfd of gas at a suction pressure of 10 psig to give a design injection rate, after providing for turbine fuel and shrinkage, of 137 MMcfd at a plant discharge pressure of 1935 psig. To meet this requirement, modifications were made to eight flow stations to permit gathering of gas from the production separators on these stations. The changes included a revamp of the flow station piping, installation of scrubbers, scraper traps, meter runs, controllers and a gathering manifold on stations already almost completely occupied by tanks, separators and oil manifolds. When it had been established that the plant had a greater capacity than that specified for its design, four additional flow stations were tied into the gathering system to augment the supply of gas feed to the plant. The original suction pressure of 10 psig was based upon gas being available at the production separators at 15 psig. In actual practice, however, it has been possible to maintain higher separator pressures, and higher compressor plant suction pressures, without loss of oil production.

The 12 flow stations supplying gas feed to the plant are located within a radius of five miles from the compressor plant. They are connected to it by pipelines ranging from 16 to 30 in. in diameter. For protection against the corrosive effect of the brackish lake water, the pipelines were covered with two coats of asphalt and wrapped with spun glass fiber. In addition, they were wrapped with heavy mesh wire and coated with concrete to secure a negative buoyancy of about 10 per cent.

To remove liquid which occasionally carries over from separators and scrubbers into the gas gathering pipelines, or lake water which could enter if a leak develops, a system of pig-traps was installed. This system provides for insertion of scrapers at the plant and removal at the flow stations.

The compressor plant is built on a reinforced concrete platform 329 ft long by 143 ft wide. The main platform—14 ft above water level—is supported by 350 reinforced concrete piles 28 in. square and 165 ft long. The beams, floor sections and the turbine compressor support boxes were pre-cast on shore and later integrated into the platform. The platform consists of three levels above the lake: a 14-ft or lower level, a 24-ft level, and a 35-ft level.

A corrugated aluminum-covered rigid-frame type building (296 ft long, 80 ft wide and 52 ft high) encloses the main operating floor at the 24-ft level and the upper floor at the 35-ft level.

Gas from flow stations connected to the plant passes through suction scrubbers for removal of entrained liquids and crude oil. The gas is compressed in seven stages from suction to plant discharge pressure and is cooled and scrubbed between each stage as well as after the last stage of compression. Raw lake water, used for gas cooling, is fed to a redwood distribution system from which it cascades over two-pass atmospheric, or open-type coolers. Hot compressed gas, up to temperatures as high as 265 deg F, from each compressor is cooled to a temperature of about 92 deg F.

Fuel for the gas turbines is supplied from either the second or third stage compressors. Also, some gas from the sixth stage of compression is withdrawn for gas lift usage in heavy oil producing areas.

Gas from the fifth stage coolers at a pressure of about 650 psig is fed to two absorbers. There it is contacted with lean oil for recovery of propane and heavier hydrocarbons. The rich oil is delivered to an LPG fractionation plant located on shore and the absorber dry gas is compressed to pressure required for its injection. Liquid hydrocarbons collected in the scrubbers are pumped to an accumulator where they join the rich oil feed stream to the LPG plant.

The first stage of compression consists of three

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units operating in parallel, the second stage of two units in parallel and the third through seventh stages are one unit each operating in series. The ten compressors are multi-stage centrifugal units. The five units comprising the first two stages are cast-iron, horizontally split-case type. The next three have forged steel cases and the last two are of the steel barrel type. Any single compressor can be isolated from the system without plant shutdown. The decrease in volume of gas compressed with one unit out of operation varies between 4 and 27 per cent depending upon which of the 10 units is out of service.

Each compressor unit is driven by a 6000-hp*, simple-cycle, two-shaft gas turbine. Each turbine has an axial-flow air compressor and a high-pressure wheel mounted on one shaft and a low pressure turbine wheel mounted on a separate shaft. Mechanical load is connected through a flexible coupling whereby compressor and turbine speeds can be varied to produce optimum performance. These turbines can deliver a maximum of 7000 hp to the output shaft at an ambient temperature of 80 deg F. Under these conditions, maximum high pressure turbine speed is 6900 rpm, the output shaft speed 5800 rpm, turbine inlet gas temperature is 1450 deg F and exhaust temperature 920 deg F.

The plant is controlled for "fail safe" operation. A master control circuit is so installed that any emergency or unsafe condition requiring plant shutdown will break circuit causing all turbines to trip out, actuate hydraulically operated valves isolating the plant from all off-platform gas or condensate sources, and automatically open safety valves to vent any pressurized plant facility. The master circuit can be manually opened at various points in the plant. Combustible gas alarms with sensing stations at six critical points warn of explosive mixtures caused by escaping gas. Electrical power for operating emergency controls and safe shutdown of the plant in case of failure of normal power supply is provided by a d.c. battery system and/or an emergency a.c. generator driven by a diesel engine which starts automatically on power failure.

Controls for normal operation are in a central control room where all plant operating functions are graphically represented. Any individual turbine compressor unit can be started or stopped from the control room. Also, all valves normally used in the control of plant can be actuated from this point. All values of temperature, pressure, flow, etc., required for plant operation are graphically indicated.

After plant auxiliary systems are in operation, the compression system can be operated, started, or shutdown from the central control room. Also, all functions required for absorber operation can be performed at this point. Auxiliary panels are provided near each turbine compressor unit and absorbers which allows "on-site" operation of these facilities.

Operation of all turbine-compressor units in the chain is coordinated by use of a system which senses plant suction pressure and sets individual turbine governors to control compressor speeds required to maintain an essentially constant plant suction pressure. This system is biased in the first and second stages by control elements which maintain compressor speeds to give essentially equal volumes of flow through all units in the compression stage.

Flow to each compressor is measured in terms of cubic feet per minute at flowing conditions. This quantity, through hydraulic control elements, actuates recycle valves which will prevent flow through the unit from reaching a point which will cause compressor surge.

Partial automation of the plant permits operation with a shift foreman and three operators per shift. Engineering studies are underway to develop methods of more fully automating plant operations.

Original design of Conservation Plant Tía Juana One provided for injection of 137 MMcfd of gas through five wells which were former oil producers converted to injection service. These wells, connected to the plant by individual 6- and 8-in. lines, were incapable of receiving the plant output at maximum allowable plant discharge pressure of 2100 psi. Accordingly, additional injection wells were drilled. At present, gas is being injected into eight injection wells in the LL-370 area. In addition, gas from this plant is being injected into the LL-5 reservoir of the TJ-102 Area to supplement gas injected into that reservoir by Conservation Plant Tía Juana Three. The plant discharge pressure required to inject the total plant output of gas in this manner is approximately 1700 psig.

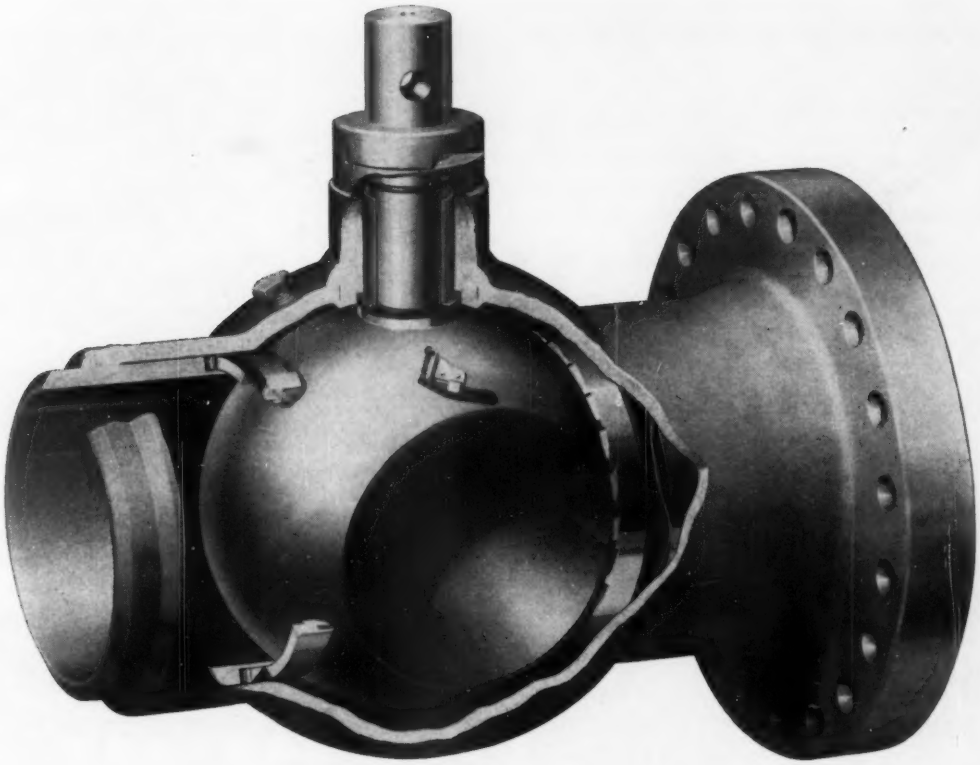
During its six years of operation, Conservation Plant Tía Juana One has been on stream 94.5 per cent of the time. Planned shutdowns for a major turnaround of the plant, once in 1956 and again in 1958, accounted for 67 per cent and corrosion inspections and repairs for 13 per cent of the total plant downtime. The remaining 20 per cent of downtime was due to miscellaneous mechanical and electrical failures.

The most serious problem encountered to date has been corrosion of the atmospheric-type gas coolers. The coolers first installed in the plant consisted of 1-in. Admiralty tubes and carbon-steel tube headers. Corrosion during the first eight months of operation was so severe that it was necessary to replace all gas cooler sections. The replacement cooler tube headers were made of carbon-steel. Their external surfaces were hot dip galvanized and the tube sheet side of the headers were clad with 0.250 in. of homogeneously bonded lead. Auxiliary tube sheets and tubes were made of 70-30 cupro-nickel. A new redwood structure was built to enclose the atmospheric sections and an aluminum wall was constructed to prevent water from splashing on pipe headers and adjacent piping. Since there is no evidence of corrosion to the replacement coolers and adjacent piping, the remedial measures are considered to be adequate.

Overall performance of the plant, as evidenced by its availability and output, has been highly satisfactory. Since inception of operations the plant has had an average stream day output of 164 MMcfd. The plant is considered to have a normal rated injection capacity of 180 MMcfd. However, during the week of June 4 to June 11, 1959 a record output of 201 MMcfd was established.

Continued on page 184

* Original manufacturer's rating was 5000-hp.



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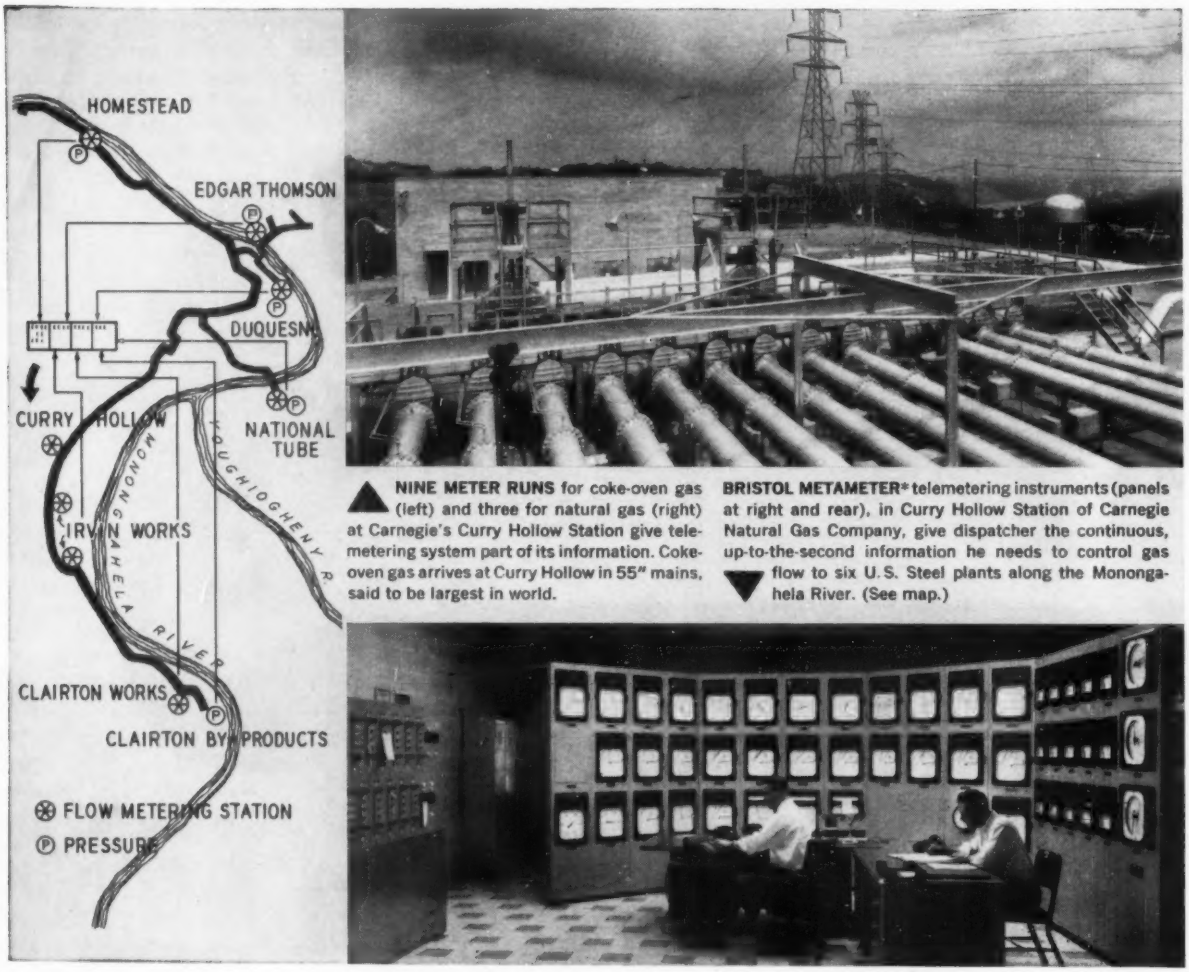

NINE METER RUNS for coke-oven gas (left) and three for natural gas (right) at Carnegie's Curry Hollow Station give telemetering system part of its information. Coke-oven gas arrives at Curry Hollow in 55" mains, said to be largest in world.

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At Curry Hollow (see map), Carnegie mixes natural gas from company-owned fields to supplement artificial gas produced at the Clairton By-Product Coke Works. Some of the coke-oven gas is used at the Clairton and Irvin Steel works. The mixed gas is supplied to the remaining plants.

The Bristol telemetering system measures individual gas flows and pressures in every main. Individual flows are totalized at Homestead, Irvin, Duquesne, and Edgar Thomson Works and transmitted to the dispatcher's office in Curry Hollow. At Curry Hollow, the Irvin and Clairton Steel Works flows are again totalized with the flow in the 55-inch mains from Clairton to secure the total coke-oven gas output.

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AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Communications and Automation

Edited by FRANK CHAPMAN

New decade counter shown

If you are looking for electron tubes that can count up to 100,000 units per second and visually display the total on their faces, look no further. Raytheon Co. has 'em.

We saw them while strolling through the exhibits at the recent Wescon show. Raytheon's Industrial Components division is credited with the development.

The new tubes are called decade counters. They record and indicate the count on 10 glowing cathodes in luminescent dials within the tubes. With numbered face plates, placed on series-connected decade counters, the total can be read visually in units, tens, hundreds, etc., during operation.

Speed range is wide. The tubes can operate at speeds low enough to count sorted eggs in a large poultry operation. Or, they can be operated fast enough to total high-speed radio-active impulses in a geiger counter.

Applications engineers foresee the decade counter's use in measuring pipeline flow and programming elapsed-time intervals, and for many other purposes.

Motorola has new personal paging system

A personal radio paging system, capable of providing selective voice communications to more than 7500 persons, has been developed by Motorola.

Operated on standard mobile radio VHF frequency bands (25-54 mc and 144-174 mc), it enables one-way communications between a central base station and individuals carrying compact Handie-Talkie radio paging receivers. When an individual is paged, an alerting tone sounds in his receiver. The voice message follows. Private communications are maintained since no other paging receiver is alerted.

The fully transistorized FM Handie-Talkie radio paging receiver provides 500 milliwatts audio output, enabling reception even in noisy locations. The radio pager operates from either a rechargeable battery or mercury cells. The rechargeable nickel cadmium supply provides up to 12 hours' operation with each charge. The replaceable mercury cells last up to 120 working hours.

The entire receiver weighs only 14 ounces and fits easily clipped in a pocket or on a belt. The receiver accommodates an external antenna.

For low capacity systems, a compact desk-top pushbutton control console is used with a regular two-way radio base station. The tone generators are included in the console. Up to 90 calls are provided with each console. Four consoles can be used in a single system, permitting up to 360 calls.

A separate tone generating console is used for high capacity systems along with a two-way radio base station and pushbutton control unit. Stations providing up to 250 watts RF power output are available. The station can generate up to 7656 individual calls.

ISA offers USSR publications

English translations of four Russian technical journals are to be continued by the Instrument Society of America, under a grant from the National Science Foundation. Included in the series are:

Automation and Remote Control—This one might be of particular interest to gas-company remote control and instrumentation people. It is considered to be the leading Soviet journal in the automatic control field. Published monthly by the Institute of Automation and Remote Control of the Academy of Science, USSR, it carries approximately 150 pages per issue of articles on all phases of automatic control theories and techniques.

Measurement Techniques—Of particular interest to those engaged in the study and application of fundamental measurement.

Instruments and Experimental Techniques—This one contains articles relating to the function, construction, application, and operation of instruments in various fields of instrumentation.

Industrial Laboratory — Articles appearing are on instrumentation for analytical chemistry, and physical and mechanical methods of material research and testing.

For information, write Foreign Translation Department, ISA, 313 6th Ave., Pittsburgh 22.

EIA asks FCC reconsideration

The microwave section of Electronics Industries Association has asked for reconsideration of the FCC Report and Order in Docket 13083, regarding the interim private microwave technical standards. EIA contends that the standards are beyond necessary limits and the effective date of Jan. 1, 1961, is too early.

The EIA filing advised the commission that the standards as adopted go beyond EIA's original recommendations, which were commensurate with the orderly implementation of the microwave spectrum. EIA feels the new standards will frustrate the normal and healthy growth of the microwave industry.

Lake Maracaibo—*Con't from p.* 180

Conservation Plant Tía Juana Two was completed in April 1957. After three weeks of trials it was put on stream. Since then it has operated continuously except for the month of July 1959 when it was brought down for its first scheduled turnaround.

This plant, located about six miles to the south of the first plant, is built on a pile foundation platform in 85 ft of water. It was constructed for the purpose of injecting gas into Eocene reservoirs in the LL-453 Area.

Gas is collected from 16 flow stations located within a radius of six miles from the compressor plant. They are connected to it by pipelines ranging from 16 to 30 in. in diameter. Also, this gathering system is interconnected with that of the first plant so that gas can be delivered to either plant from these stations.

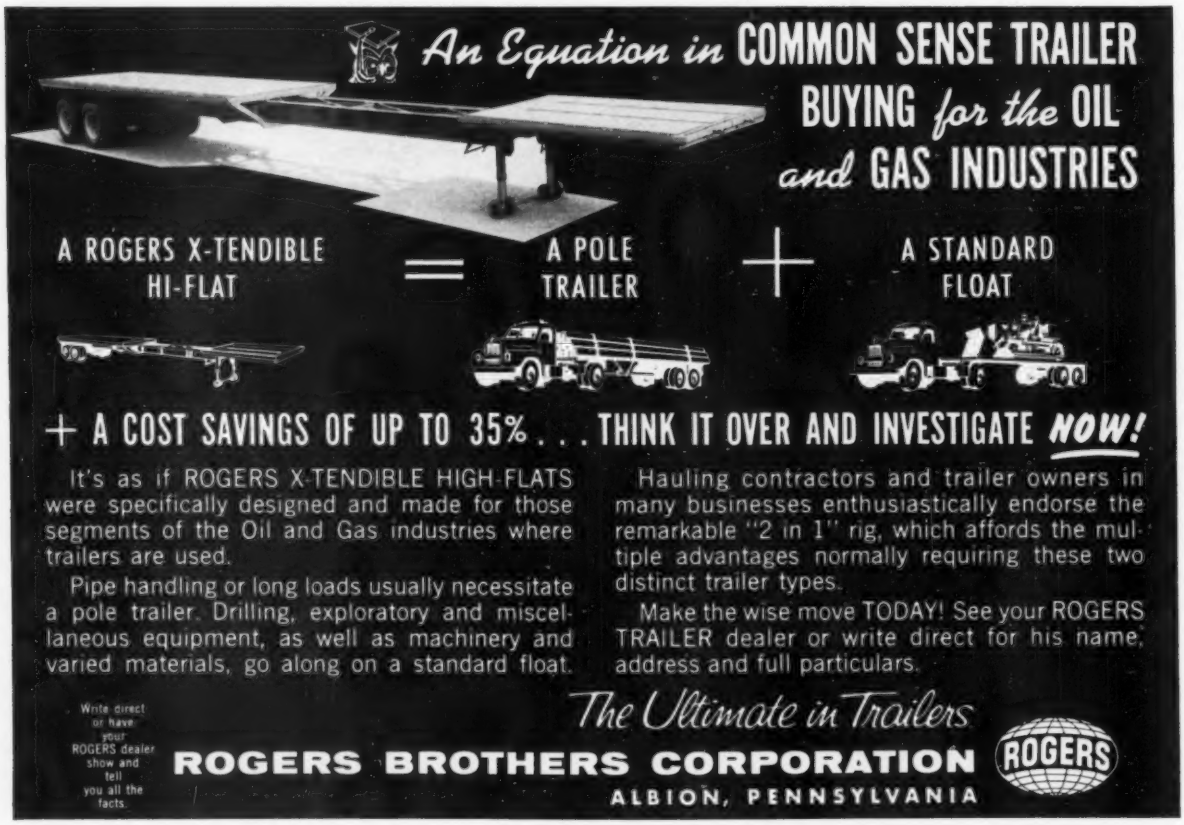
Design of Plant Two was based upon an injection requirement of 300 MMcfd of gas compressed from 40 to 1800 psi. Main differences between this and the first plant are in its size, number and type of gas turbines and the arrangement of turbine-compressor units. The control system in this plant (and in subsequent plants also) is generally the same as installed in the first plant. The platform is 131 ft wide and 440 ft long. Major equipment consists of 12 gas turbine-driven centrifugal compressor units arranged in twin banks of six units each. The gas turbines are multistage, simple cycle, single shaft units with a nominal rating of 7000 hp at 6000 rpm and 90 deg F ambient temperature. They can deliver under these conditions a maximum of 7960 hp at maximum allowable turbine inlet temperature of 1350 deg F. The first two turbines in each bank are equipped with reduction gears with a ratio of 1.5.1.

The compressor units in each bank operate in series, each bank operating independently. The compressors can be operated to furnish gas at the required plant discharge pressure with any single unit out of service except the sixth stage. With a sixth-stage unit out of service, that bank must be shut down since the final discharge pressure is less than the minimum required for injection.

Unlike the first plant, Plant Two and its attendant facilities was not designed with liberal capacity factors. Consequently, actual performance has equalled but not exceeded design.

Conservation Plant Tía Juana Three, which was built for the purpose of injecting gas in reservoirs of the TJ-102 Area, was completed and placed in operation in October 1958. It is located 3.5 miles northeast of Conservation Plant Tía Juana One and 4.5 miles from shore.

The gas gathering system serving this plant is inter-connected with those of the first and second plant so as to provide maximum flexibility in the source of supply of gas to each plant. The injection systems are likewise inter-connected so that gas from any plant can be delivered to any of the reservoirs into which gas is being injected.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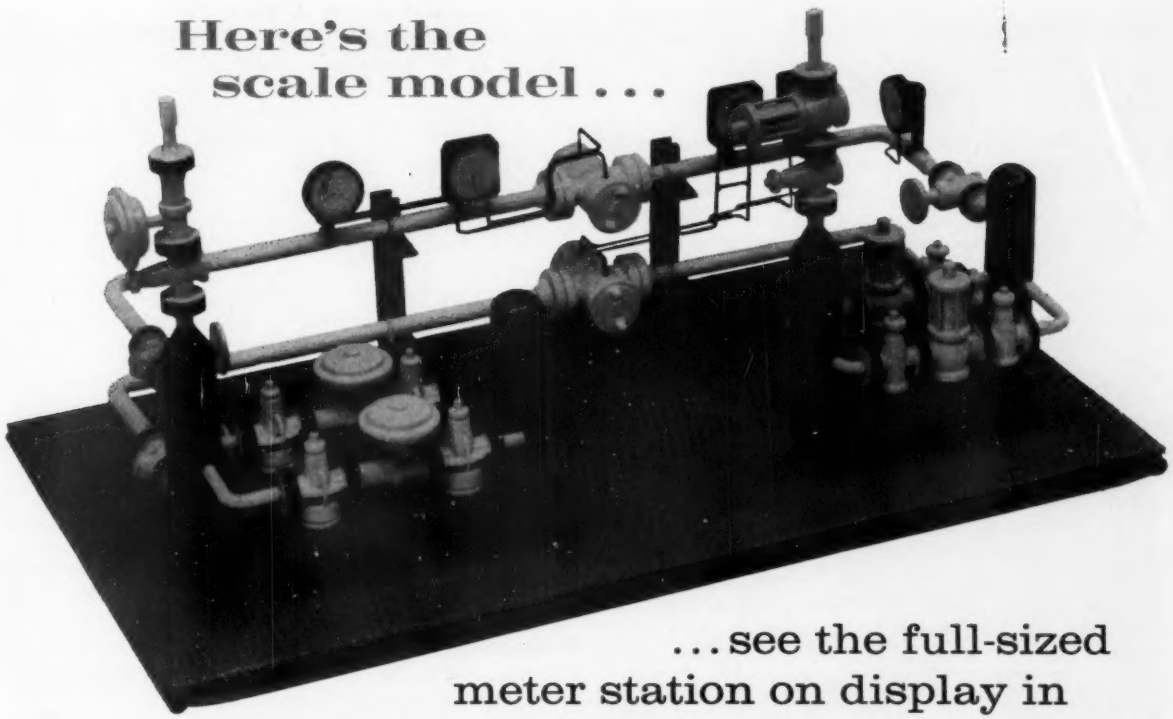

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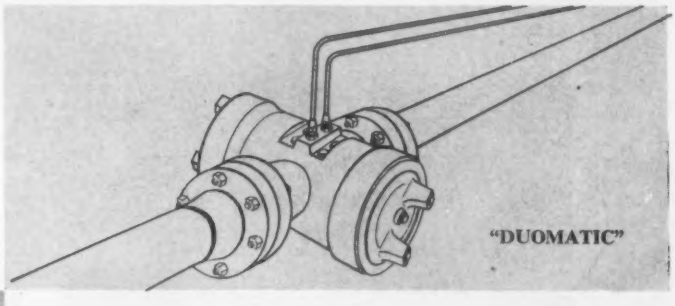
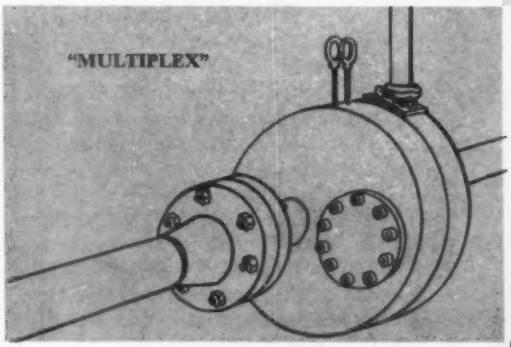


"DUOMATIC"



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194

The major part of the gathering system consists of 40 in. pipelines. Lines of this size were installed to provide for gathering of the estimated future maximum quantity of gas from the flow stations to which they are connected.

Pre-investment was made also in the compressor plant platform to provide for future expansion of the plant without requiring an extended shutdown of the original plant. This platform is 136 ft wide by 550 ft long—large enough to accommodate a plant of exactly twice the size already built.

The compressor plant has a capacity, excluding fuel and shrinkage, of 131 MMcfd of injection gas and 26 MMcfd of gas lift gas or 150 MMcfd of injection gas. Gas is compressed in seven stages from plant inlet pressure of 16 psig to a final discharge pressure of 2000 psig. Gas lift gas is taken after the sixth compression stage at a pressure of 900 psig. The turbine-compressor units are of the same type and manufacture as are installed in Plant Two.

Two months after start of operations it became necessary to shut down Plant Three for major repairs to the gas turbines. All of the turbine rotors were returned to the factory for modifications and repair of defects. The plant resumed operations in June 1959 and has operated satisfactorily since that time.

• Conservation Plant Bachaquero One

The fourth plant, Conservation Plant Bachaquero One, is almost a twin of Plant Three. It is located 22 miles southeast of Plant Three and 4.5 miles from shore in the Bachaquero field. It has a capacity of 145 MMcf daily of gas from 21 Bachaquero flow stations from an inlet pressure of 19 psig to 2500 psig.

Pending further development of the Bachaquero field and accumulation of sufficient reservoir data to determine the effectiveness of gas injection in the Bachaquero field, the output of this plant will be delivered by a 22-mile pipeline to the injection manifold Plant Two. From there it will be delivered through the existing inter-plant injection system to the TJ-102 Area to supplement the volume gas injected in that area by Plant Three.

• Summary

Upon completion of Conservation Plant Bachaquero One, Creole had installed four gas turbine-driven centrifugal compressor plants in Lake Maracaibo. These plants with a total of 242,000 hp, have a capacity to inject a total of 775 MMcfd of gas into oil producing reservoirs.

The gas supplied to these plants is collected from 63 flow stations through 99 miles of 16- to 40-in. pipelines. Compressed gas from these plants is injected into 17 wells through 42 miles of 6- to 12-in. pipelines. Investment in the four plants and their gathering and injection systems aggregates $102 million. ■

This article is adapted from a talk presented at a recent meeting of the California Natural Gasoline Association.

9001-HC

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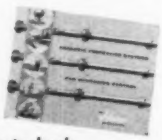

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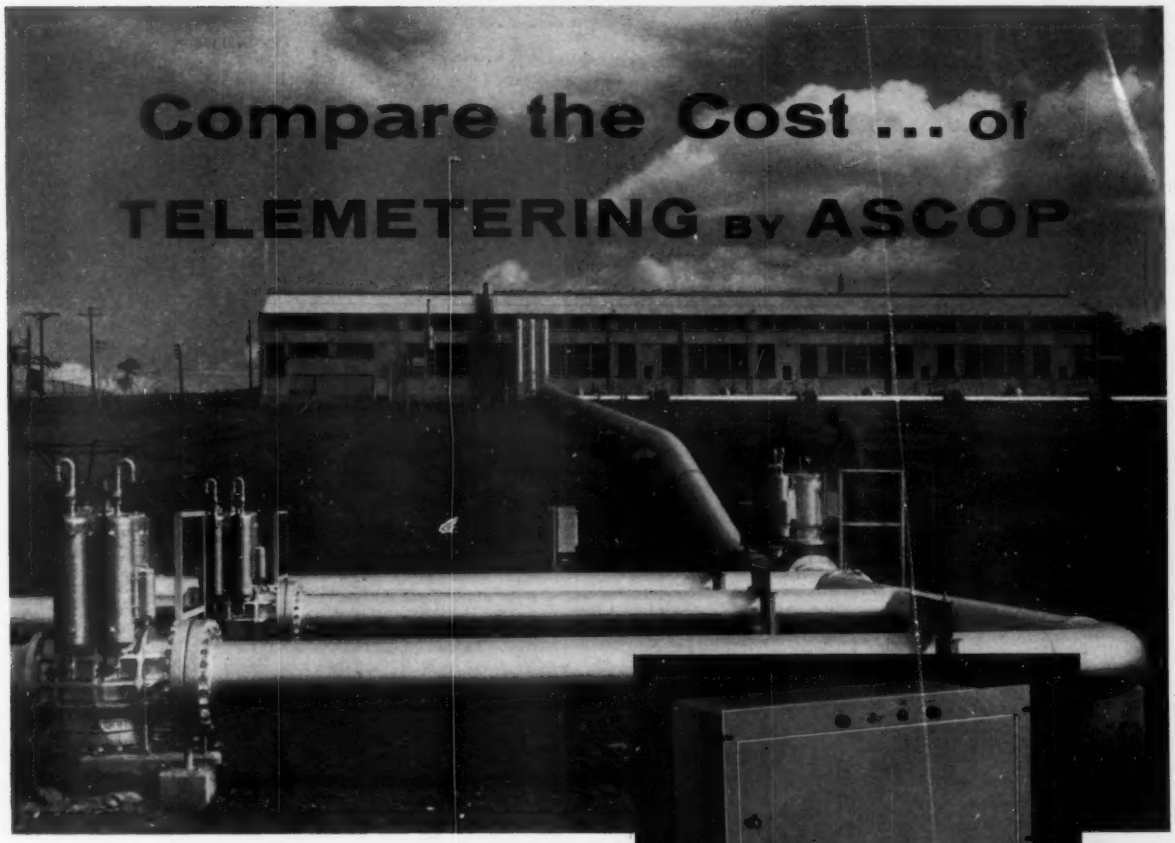

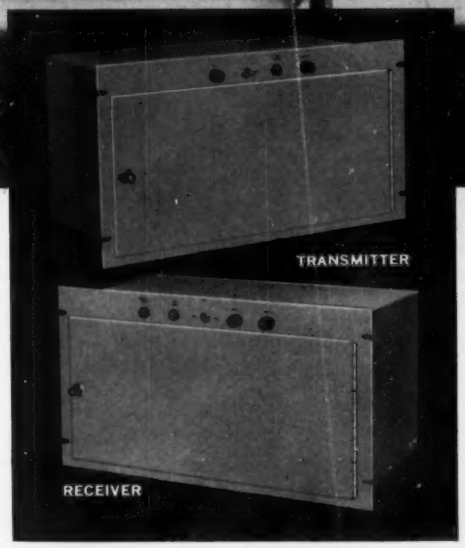

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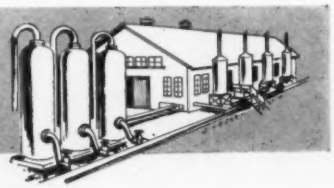
GAS PIPELINE NEWS



Gas bill capers

As Congress passed into the great beyond in early September, several gas bills, on the critical list at best, died with it. However, two Texans have announced plans to throw new natural gas bills in the hopper for the next Congress.

Reps. Ikard (Frank) and Rogers (Walter), both Demos from Lone Star country, will introduce new bills to replace those of recent demise. They hope to muster enough support to move the things before the House for action, but neither looks forward to an easy path into law.

While Ikard and Rogers were announcing their intentions, a "cloud nine" meeting of industry stalwarts was rumored in the making. As the boys in the back room have it, more vocal types from the gas producers, distributors and pipelines will hold a summit meeting to display industry unity and explore for a draft of legislation that will suit all segments. Best guess as to when and where: New York, around Oct. 7.

More from Washington

President Eisenhower and the chairmen of the Federal Power Commission, Federal Communications Commission, Civil Aeronautics Board, Federal Trade Commission, Securities & Exchange Commission, and the Interstate Commerce Commission, got their heads together and came up with a plan to study ways and means to speed up the work of the six regulatory bodies.

The program was suggested by the heads of the agencies themselves and has as target finding methods and procedures to cut into backlogs of work and delays that plague the administrative agencies. The chairmen do not, however, have any interest in meeting-developed rules being imposed on the agencies. Rather, they want to study how the agencies can do a better, more efficient job in their assigned areas.

President Eisenhower has said he will call the conference.

FPC doings

The appointment of John C. Mason, a career staff member, as general counsel of the commission was announced on Sept. 7 by the Federal Power Commission.

At 48, Mason has been a member of the commission's staff since 1934. He started as a clerk and has served as attorney on its legal staff since 1941, after getting his law degree while working for FPC. Mason was named assistant general counsel in 1955 and deputy a year later. He replaces the retired Willard W. Gatchell.

* * *

Chairman Jerome K. Kuykendall reports that FPC authorized 9400 miles of gas pipeline, valued at $846,677,000, during the fiscal year ended June 30, 1960.

Both the mileage and cost figures represent commission record highs.

In the same period, about 403,000 hp in compressor units was authorized for construction. The statistics represent only those facilities authorized for interstate pipeline companies under FPC jurisdiction. They do not include papers issued to independent producers.

The additions permitted an overall capacity increase of more than 3.25 billion cu ft per day to the nation's gas transmission systems.

Coal still plays the 'unfair' record

The "unfair" practices of its competitors are still being blamed as the factor that holds back increases in coal production. Walter F. Schulten, vice president of Consolidated Coal Co., told the Pennsylvania Coal Festival banquet that residual oil imports and dump sales of natural gas prevent "thousands of miners and railroaders from earning a respectable living" and also "take away dollars from every industry that sells to miners from all business — including clothes stores, gasoline stations, and barber shops—that deal with miners."

And so that warped record is played over again and on, and on, and on. However, if balancing our load factor problems with interruptible gas sales to industrial customers (none of whom have a pistol at their heads when they sign gas purchase contracts) is ruining the barber shops of Pennsylvania and, in the doing, creating a bunch of long-hairs back there, perhaps something does need to be done.

Ownership explained

Comes to hand a welcomed letter from F. W. McChesney, vice president and manager of Pacific Gas Transmission Co., San Francisco. He called our attention to the incorrect line-up of ownership GAS presented on page 122 of our September issue, for which we thank him.

Correctly, from McChesney, Pacific Gas & Electric will own 50 per cent of Pacific Gas Transmission; other project sponsors will own 25 per cent, and the public will hold the remaining 25 per cent.

Pacific Gas Transmission will, in turn, own one-third of the stock of Alberta Natural Gas Co., and Westcoast Transmission Co. will own another one-third. The remaining one-third will be owned by the public.

Alberta & Southern will always be wholly owned by Pacific Gas & Electric.

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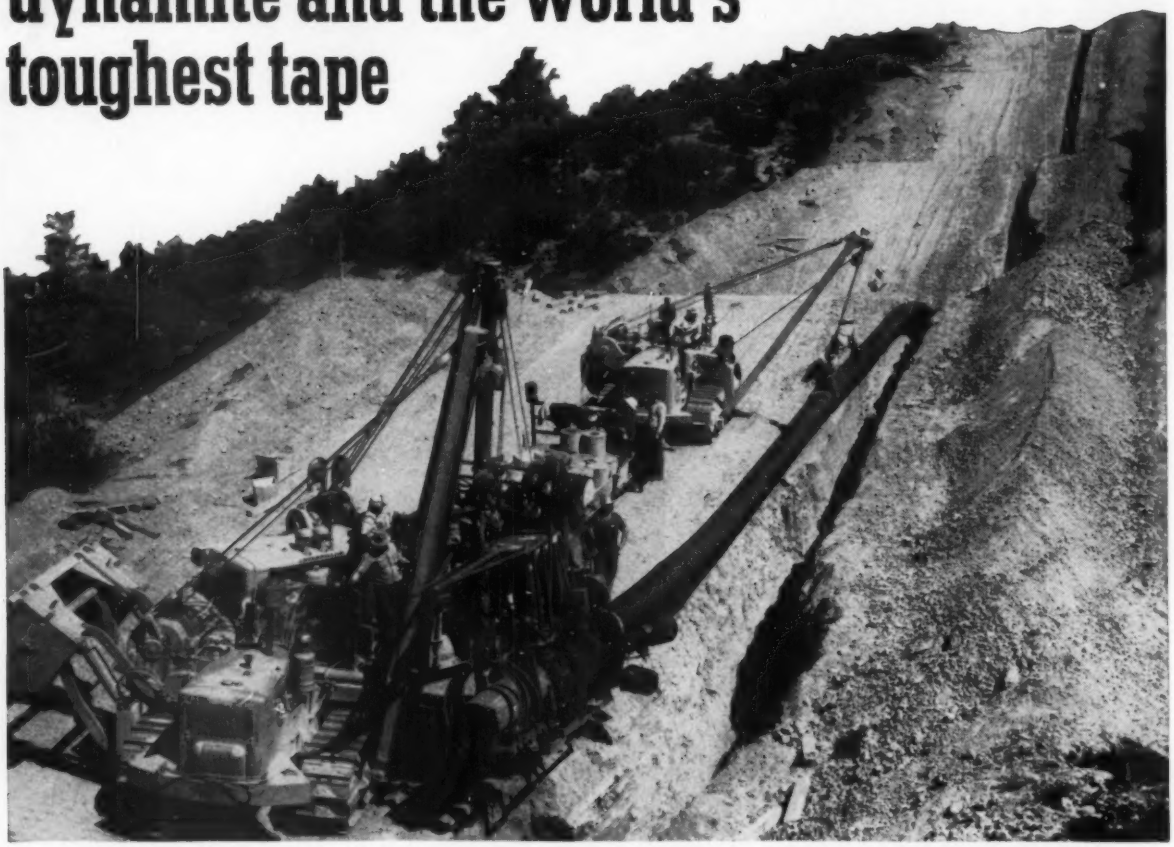

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Building B.C. gathering system

Construction is under way on the first phase of a $93 million pipeline system in northeastern British Columbia. Gas Trunk Line of British Columbia Ltd. will deliver gas from newly discovered fields near Fort Nelson to markets in southern B.C. and the United States. Completion is slated for December 1961.

The 30-in., 245-mile line will connect with the existing Westcoast Transmission line near Chetwynd, B. C. Initial capacity is 350 MMcfd. Additional compression will boost it to 650 MMcf.

Westcoast has to add two compressor stations to take the new gas. They'll increase Westcoast's mainline capacity to 660 MMcfd. Plans have been made to loop the Westcoast system and double its volume to more than 1 billion cu ft.

Gas Trunk Line will be owned by producing companies active in the Fort Nelson area. Pacific Petroleums Ltd. is sponsor of the project.

The new pipeline system is part of a major construction and petroleum development program under way in British Columbia. In the next year, some $225 million will be spent in the province. Projects included:

—Westcoast's compressor stations costing $25 million.

—Construction of the Alberta Natural Gas Co. Ltd. line through southeastern B. C. Now under way, this line will cost about $40 million.

—Drilling of between 150 and 175 wells in the province at a cost of $45 million.

—Construction of gas distribution lines to serve communities in the Kootenay district and expansion of existing systems in interior B. C. Cost: $15 million.

FPC raises suggested

FPC has issued a permanent certificate to Natural Gas Pipeline Co.'s $62.5 million project, in operation since December 1958. The 500-mile line extends from Fritch, Texas, to Joliet, Ill.

The recent order authorized 15 producers to sell gas to NGPL from fields in Oklahoma and Texas. However, sales from the Chitwood, South Rainey and West Cement fields in Oklahoma are conditioned to limit initial price to 15 cents a thousand rather than the 16 cents proposed by the producers. Approved was the proposed 13-cent initial price for gas from fields in Jack and Wise counties, Texas.

Oklahoma gas price

Earlier this year, Presiding Examiner William J. Costello wanted to limit the initial price of the Oklahoma gas to 11 cents per Mcf. The FPC, however, held that while the 16-cent price was not shown to be "in line," 15 cents "is required . . ."

In its ruling, FPC said the initial price problem cannot be solved by attempting to perpetuate a price level that has become obsolete." In fact, "we think that such a price would prevent NGPL from entering into further gas supply contracts in the area."

Wellhead pressure booster tested

Experiments are being run with a natural gas-burning turbine as part of a system to boost gas wellhead pressure to pipeline pressure.

A product of the Garrett Corp.'s AiResearch Manufacturing Div., the 100-hp Model 70 turbine is serving round-the-clock as a first-stage compressor to replenish pressure lost by depletion in a gas gathering system.

Purpose of the test run is to provide experience and performance data on natural gas-burning turbines for new industrial applications.

The turbine is slightly modified from a similar liquid fueled, shaft power unit produced by AiResearch and in use by the Air Force, Army and Navy.

In the simple modification, the turbine fuel cluster is replaced by a standard AiResearch speed sensor and valve, which regulate the gas flow. Only other modification is the replacement of the fuel atomizer with a nozzle.

FPC hearing joint plan

Hearings are being held on a joint plan of Trunkline Gas Co., Houston, and Mississippi River Transmission Corp., newly formed subsidiary of Mississippi River Fuel Corp. Combined cost of the work covered by Dockets CP60-22 et al is $34.6 million.

Trunkline's share consists of about 155 miles of mainline loops and 75 miles of supply laterals, plus measuring station and other related facilities. Cost: $25.5 million. With these facilities, Trunkline will take gas from new sources in southern Louisiana and from existing sources in Louisiana and Texas. Resale will be made to eight customers.

These customers and the daily cubic foot volumes are: Mississippi River Transmission, 50 MMcf; Northern Indiana Public Service, Hammond, 20 MMcf; Central Illinois Electric & Gas, Rockford, 1.6 MMcf; City of Rensselaer, Ind., 2 MMcf; Central Illinois Public Service Co., Springfield, 1.4 MMcf; Citizens Gas Co., Tuscola, Ill., 180 Mcf; United Cities Gas Co., Chicago, 300 Mcf; and the City of McLeansboro, Ill., 215 Mcf.

As part of its plan, Trunkline wants to sell about 130 MMcfd to its parent, Panhandle Eastern. However, this plan won't be considered until FPC is prepared to proceed with Panhandle's own proposed expansion program (CP60-60). The $25.5 million estimated cost is only the first phase of Trunkline's plan, excluding the sale of additional gas to Panhandle.

Mississippi River Transmission will build about 94 miles of line from a point on Trunkline's system in Clay County, Ill., to the St. Louis area. It will sell gas to Laclede Gas Co., St. Louis (42.5 MMcfd) and Illinois Power Co., Decatur (7.5 MMcfd). Estimated cost is nearly $10 million.

Mississippi also wants to develop underground gas storage in the St. Jacob field area of Madison and St. Clair counties, Ill. Twenty-five per cent of the storage capacity will be available to its parent.

Consolidated with the pipeline plans are filings by three independent producers seeking to sell gas to Trunkline. Also being heard is a Trunkline application to sell gas to a power plant owned by the City of Rensselaer.

Trunkline's total construction plans call for spending $45.1 million.

Different answers from Catco application

Three producers can sell Wyoming gas to El Paso Natural Gas Co. if they reduce contract prices from 16 cents to 15 cents per Mcf (Docket G-13679 et al).

Both producers and FPC relied on the Supreme Court's Catco decision. But, they came up with different conclusions.

Catco held that FPC should consider all factors and that it has broad discretion in determining whether a producer's proposed initial price has been supported. But, FPC said, it emphasized "that price is an element of prime importance which must be scrutinized closely with a view to protecting the consumer by holding the line against unjustified price rises." The court said this was particularly so for prices from new production areas, where large volumes of gas may be present.

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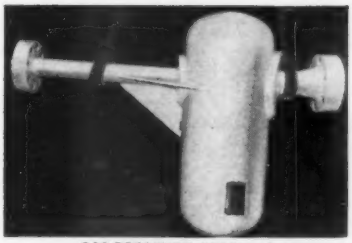


GAS PRESSURE, 1500 p.s.i.

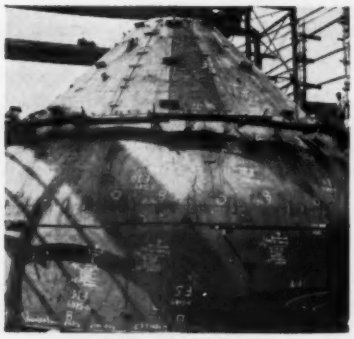
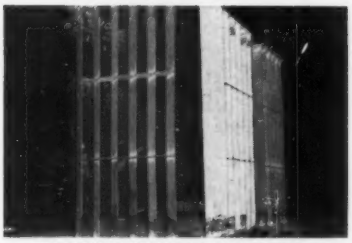


PLATE WORK, 55′ dia. cone

GALVANIZING POT



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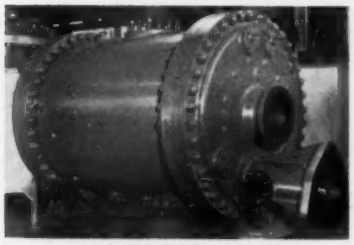

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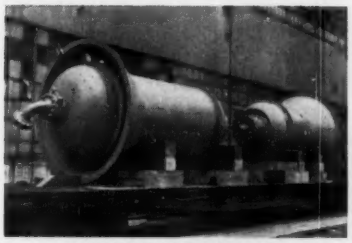

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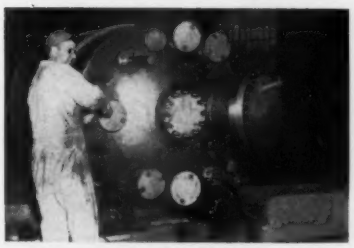
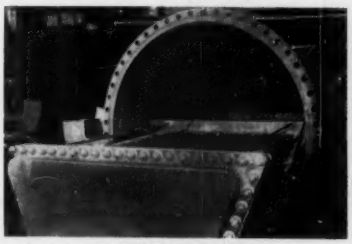


STAINLESS AUTOCLAVE



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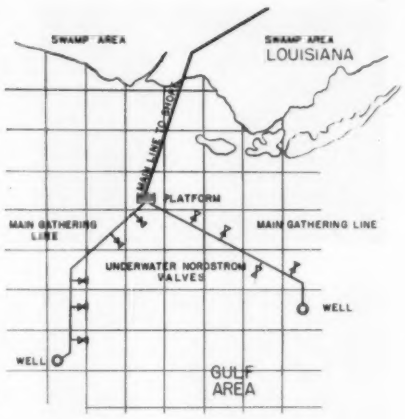
Transco plans for future offshore wells

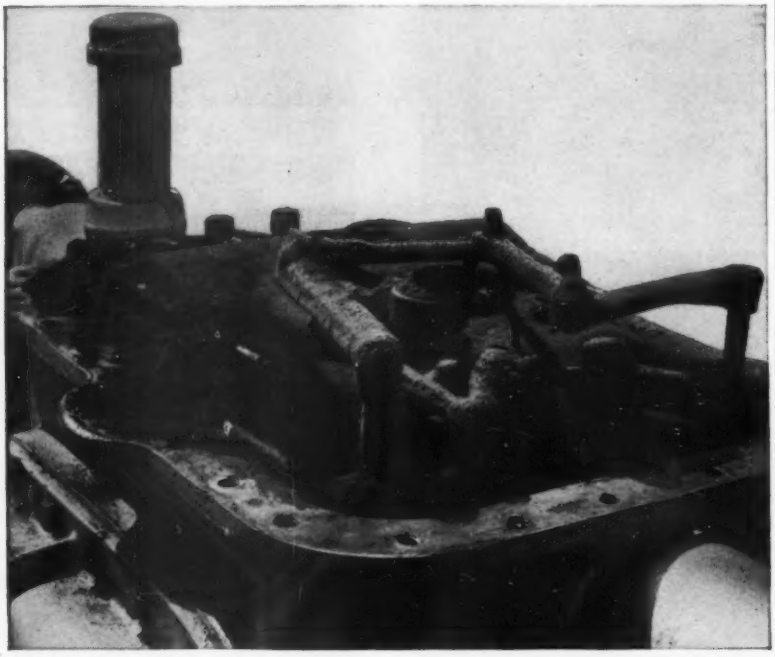
Valves are usually expected to work without much attention. But now, a few have been left dormant at the bottom of the Gulf of Mexico where they are expected to operate whenever called upon—years hence perhaps.

When Transcontinental Gas Pipe Line Corp. laid underwater pipelines offshore the coast of Louisiana, it made provisions for the future. There was the strong possibility that other wells would be drilled some day and tied in to the lines. Naturally, it would be cheaper to tie these into existing lines than to lay new lines. Also, it would be more economical to make provisions for such a tie-in while laying the initial main gathering line than to make an underwater pressure tap later on.

Each standby connection consists of a short nipple welded into the mainline. Welded to the nipple is a Rockwell-Nordstrom lubricated plug valve with the flange end blanked off with a blind flange.



When a new producing well is to be tied into the main gathering line, it can be connected to the line by removing the blind flange, connecting the new well's line, and turning the valve. Periodic checks have shown that the valves are remaining ready. A quick quarter turn will be all that is needed when it's time to use the connection.



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Peoples Gulf wants capacity boosted

Following close on the heels of an approved 85 MMcfd boost in capacity, Peoples Gulf Coast Natural Gas & Pipeline Co. has plans to add another 60 MMcfd to its capacity. At the same time, Natural Gas Pipeline Co. of America sought to increase its deliverability by 40 MMcfd. The total 100 MMcfd boost would cost an estimated $23.7 million.

Peoples Gulf Coast would supercharge 71 compressor engines and construct 27 miles of pipeline. NGPL's plan involves 62 miles of line and a number of river crossings.

Still pending before FPC is a plan calling for the facilities of Peoples Gulf Coast to be acquired and operated by NGPL.

FPC approves sale

Cumberland & Allegheny Gas Co., Pittsburgh, can sell its Maryland distribution facilities to an affiliate under a modified decision issued by FPC (Docket G-17226).

Cumberland will sell facilities to Columbia Gas of Maryland Inc., its affiliate in the Columbia Gas System.

Northern trims construction plan

Northern Natural Gas Co., Omaha, has received an amended certificate on its $114.6 million construction project (Docket G-17485 et al).

Overall cost is reduced to $101.4 million.

Late in July, FPC told Northern to go ahead with about 430 miles of large diameter line, 2178 miles of branches, 57,400 hp in additional compression, and 303 town border stations.

Northern asked for the reduction because it would not be giving service to 46 of the 342 communities for which service was authorized. Twenty-six of the towns will not receive service because the distribution companies involved would not make the contributions to construction required by the commission's July order. Northern said it would not be able to serve the other 18 communities because Iron Ranges Natural Gas Co., which was to take the gas from Northern for delivery to these towns, also failed to meet conditions of the July order.

Twenty-four of the communities are in Minnesota, 12 in Iowa, 5 in Nebraska, and 5 in South Dakota.

El Paso, Rexall building plants

Building programs for their joint petrochemical ventures have been announced by El Paso Natural Gas Products Co. and Rexall Chemical Co.

Three multi-million dollar contracts have been let covering design and construction of olefin and polyolefin plants in Odessa, Texas. El Paso's major part will be the operation of the olefin plant to furnish raw stock for the chemical plants operated by Rexall.

Research laboratory and office facilities will be built in Paramus, N. J.

Canadians name energy counsellor

Canadians are taking steps to protect their interests as an increasingly large supplier of natural gas to this country.

N. R. Chappell, formerly a Canadian Embassy attache on joint defense production problems between the two countries, has been named special "energy counsellor." Chappell is a career civil servant with the Canadian government.

While he will be concerned with all U. S.-Canadian energy problems, most of his time will be spent keeping an eye on natural gas matters. This will include FPC actions on gas imports, and activities involving exports or imports of gas between the U. S. and other neighboring countries, particularly Mexico.

Panhandle wants storage

Panhandle Eastern Pipe Line Co. wants to conduct storage and production testing operations in its Waverly storage field in Sangamon and Morgan counties, Ill. (Docket G-19461).

Panhandle has been developing the Waverly site since 1952, with preliminary testing in 1954 and 1955. Injection and storage testing started in 1956 and is continuing.

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FPC doubts Transco supply

In September GAS we said "Transco has gas, can go" (p. 122). But the FPC says Transco hasn't got the gas, so can't go (Dockets G-20107 et al). The commission remanded the case to Presiding Examiner Robert M. Weston, who had found Transco's gas reserves adequate for a 12-year period.

A number of sources relied upon by Transco "are open to very substantial doubts," the commission said. Loss of any sources would leave Transco with less than the required reserves.

FPC said Transco included in its gas supply some 234.1 billion cu ft of gas certificated in an earlier proceeding (Docket G-16603). This proceeding is now subject to rehearing as to whether a price condition should be attached to the producer certificates. The producers have refused to attach the gas until the price question is resolved. Until the gas is committed to interstate service, the FPC said, Transco cannot include it in its gas supply showing.

Also rejected was Transco's claim of 292.8 billion cu ft of nonflow tested reservoirs. Where the overall supply situation is as critical as Transco's, the commission said it could not allow the attachment of additional consumers based on the speculation generated by other and less reliable sources.

Transco also proposed to buy its largest volumes of gas from certain fields in the later years of their life, according to the commission, which questioned whether any producer would consider it a good procedure to drill the additional wells necessary for increased deliveries at a time when the field is nearing depletion.

Import plan heard

PFC is hearing Tennessee Gas Transmission Co.'s plan to import up to 204 MMcfd from Canada on an interruptible basis (Dockets G-20388 et al).

TGT plans to receive the gas from Trans-Canada Pipe Line Ltd. near Niagara Falls, N. Y., on an "as and when available" basis, and subject to the ability of TGT's present facilities to transport the interruptible volumes.

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TGT gets 6⅛% rate of return

Tennessee Gas Transmission Co.'s sought-after 7 per cent rate of return was trimmed to 6⅛ per cent by the FPC.

Involved is a proposed $26.6 million rate increase which TGT has been collecting, subject to refund, since April. PFC's order did not contain an estimate of the reduction resulting from the lower rate of return.

Heart of the matter on the rate of return issue, said FPC, was the question of the allowance of TGT's common equity. Tennessee contended it should be allowed a return of 14 to 15 per cent on its common equity. Historically it has been allowed that much and TGT believes it should now be granted the same return to maintain its relative position.

The commission ruled that there was no sound basis for TGT's claim. "To accept such a basis . . . would be to deny recognition of changes in market prices, changes in dividend and earnings requirements of investors, changes in the relative risk of the . . . industry as compared to other industries, and changes in the relative risk of companies within the natural gas industry," the FPC declared.

Tennessee also argued against the use of earnings-price ratios as a measure of investor appraisal and as a guide to determining the proper equity allowance. It relied instead on current earnings-book value ratios. But FPC reaffirmed its position in the Southern Natural Gas Co. case (see GAS, September, p. 126). There it held that the earnings-price ratios may properly be used "with judgment together with other factors," in determining a reasonable allowance for equity.

FPC limits Midwestern return to 6.38%

FPC has limited Midwestern Gas Transmission Co.'s rate of return to no more than 6.38 per cent. The commission rejected Midwestern's plea for a 7 per cent return for its northern system, saying that "the proper return . . . is 6½ per cent per year."

The 6½ per cent rate and the 6¼ per cent previously allowed on Midwestern's southern system will permit an average of about 6.38 per cent on the undepreciated cost of plant for both systems.

The commission also objected to Midwestern's inclusion of four rate schedules for the southern system covering services not yet authorized, and the reservation of tariff sheets for future use.

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Illinois okays Peoples storage plan

Peoples Gas Light & Coke Co. can develop a new underground storage area near Mahomet in Champaign county, Ill. The State Commerce Commission okayed its plan to construct, operate and maintain the reservoir on a pilot operation. However, Peoples Gas must take out $500,000 insurance against damage which might result from operation of the plant.

Opposing the plan were Northern Illinois Gas Co., North Shore Gas Co., and a group of farmers and landowners in the area.

Iroquois systems okay

New York's PSC authorized Iroquois Gas Corp., Buffalo, to construct new gas distribution systems in the towns of Grand Island (Erie county) and Porter (Niagara county).

Milwaukee agent named

Chipley & Jensen Inc., Milwaukee, is sales representative for Daniel Orifice Fitting Co., Houston. Sales area includes all but the western portion of Wisconsin and reaches north to include the upper Michigan peninsula.

Mexico output expands

Welding fittings are being made in Mexico City by Tube Turns de Mexico S. A. The company has been manufacturing and selling flanges in Mexico since 1957 under the direction of Tube Turns in Louisville, Ky.

Coating prices down

New price schedules covering the entire line of Polyken pipeline coatings have been announced. According to Kendall Co.'s Polyken Sales division, prices have been reduced 7 to 12 per cent on truck load quantities. Prices on less-than-truckload orders have dropped as much as 27 per cent.

Atlantic gets okay

Atlantic Seaboard Corp., Charleston, W. V., can increase the capacity of its Cobb-Baltimore pipeline (Docket G-20091). The company will spend nearly $2 million on 13.4 miles of 26-in. and 6.4 miles of 20-in. loops in Virginia and Maryland.

Reopens in Nova Scotia

To meet a growing market demand for its marine gas and diesel engines, Cooper-Bessemer of Canada Ltd., has reopened its Halifax, Nova Scotia warehouse. The warehouse facility was closed in 1958 because of a depressed condition in the diesel and gas engine market. At that time, the warehouse was relocated at Gloucester, Mass.

Opens Houston office

Walworth Co., New York, has formed a new Lubricated Plug Valve division with sales and service headquarters in Houston. Modern manufacturing facilities are available to the new division in Walworth's two-year-old plant in East St. Louis, Ill.

corrosion • *Continued*

from page 27

dangerously high potential with respect to earth. Another, and quite different, kind of ground is that intended to avert fire and explosion hazard by grounding electrostatic charges developed in the handling of fluids such as gasoline. The currents to be handled by such grounds are micro-amperes; the smallest wires would be large enough, if they had adequate mechanical strength. More important, the ground itself need merely be continuous; it does not have to be of low resistance. Actually, it is all but impossible to build a pipeline as much as 500 ft long, with presently available coating materials,

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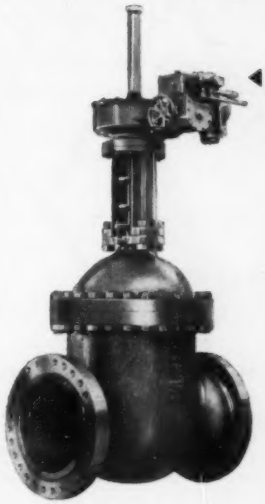

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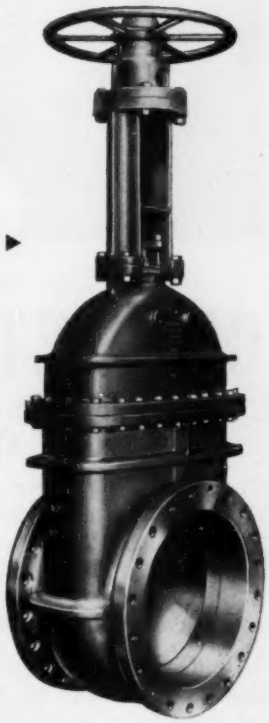

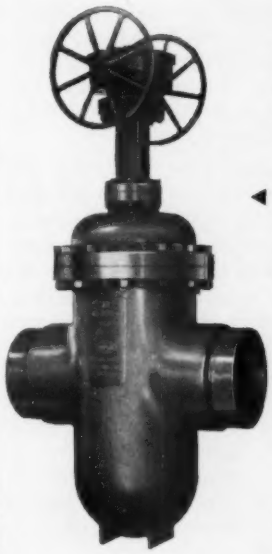

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without its automatically being "grounded" well enough to satisfy the requirements of electrostatic grounding. Certainly the business of connecting four or more copper ground rods to a large steel tank, which is sitting on the ground, is totally unnecessary. Similarly the provision of copper ground rods for aircraft fueling lines, so that they will be "grounded," does nothing but increase either the corrosion of the lines or the amount of current needed for their cathodic protection.

The answer to this one is to omit grounds where they are not needed. On bare structures—such as tanks—a ground can serve no useful function. On extensive pipelines, no matter how well coated, the same is true. On very short sections, if the coating is excellent, there might be some need for a ground. In such a case, a single magnesium or zinc anode, whether needed or not as part of a cathodic protection system, will afford all the ground required for electrostatic grounding. ■

Washington •

Cont'd. from page 25

thirds of the full Senate membership. Sen. Lyndon Johnson, as leader of the Senate Democratic majority, never pressed hard for the measure because of its obvious unpopularity in his home state of Texas.

In the House, his fellow Texan Sam Rayburn, also majority leader, has been content to let opponents talk about cutting this "inequitable tax benefit," but not to permit any votes that might produce a win for the depletion cutters.

But things have changed. Sen. Johnson and Rep. Rayburn at least in public, are supporting the Democratic platform in the current campaign which calls for reducing depletion allowances. It is entirely possible that depletion foes next year will be able to force the Democratic leadership to make good on the platform promise. A full vote by Democrats, even discounting those from gas and oil producing states who would undoubtedly oppose it or not vote, could easily bring the reduction long blocked by the gas and oil industry.

Union leaders, among the major backers of the Kennedy-Johnson team in the election campaign, have strongly insisted on cutting the depletion allowance. They have also demanded the Democrats get started on studies through a special Senate-House committee which would produce a national fuels policy. There is no question that a major objective of the study is a coal industry-sponsored bid to limit sales of gas to industrial users.

Another probability for next year is passage of some legislation which will have the effect of separating the industry from the FPC. This would be by a bill, similar to one sponsored by Rep. Oren Harris (D., Ark.) and approved this year by the House Commerce Committee which he heads. It would set tough new restrictions on contacts between the industry and the agency as well as tightening standards of conduct for members of the FPC and the other regulatory bodies.

Measure is an outgrowth of the scandal hunting probes of the agencies by the Harris group, one of which involved contacts made by lawyer Thomas G. Corcoran with FPC members on behalf of Tennessee Gas Transmission Co., and its subsidiary, Midwestern Gas Transmission Co.

There are several other possibilities for an attacking Congress. One may well be a law clamping strict controls over business expense account tax deductions.

There are also prospects for some favorable legislation. Two measures which made some headway this year will be reintroduced next year and probably will pass. Both are sponsored by Rep. Hale Boggs (D., La.). One would give special tax deductions to income earned overseas by U. S. firms. The other would change the tax laws to make rules governing business deductions for lobbying and similar expenses more realistic.

Pipeline People

CHARLES E. TERRELL, superintendent of Southern Natural Gas Co.'s measurement department since 1930, has retired. Terrell has held many positions in gas industry organizations. In 1940 he became a member of the general committee of the Southwestern Gas Measurement Short Course. He was general chairman of this committee in 1949 and served on the executive committee for nine years. Terrell served as chairman of the AGA Measurement Committee in 1957 after having been a committee member since 1953. In 1958, Terrell won the AGA's Award of Merit in recognition of his work on various committees, including chairmanship of the gas committee for the Gas Measurement Manual. He has been named editor of the forthcoming AGA Gas Measurement Manual and will devote his time to this work until the manual is published.

C. E. Terrell
Southern

Tom P. Walker
Burgess

TOM P. WALKER, former chairman of the board of Transcontinental Gas Pipe Line Corp., has been elected to the board of directors of Burgess-Manning Co., Libertyville, Ill., and Dallas.

CHARLES M. HUNTER has been promoted to general superintendent of Southern Natural Gas Co., Birmingham. Hunter has been assistant general superintendent.

ROBERT H. DAVIS is chief engineer of Motorola's microwave department. Joining Motorola in 1950, Davis served as a field project engineer for four years, then was named manager of microwave systems engineering in 1954. In 1958 he assumed the additional responsibilities of microwave publications.

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CHARLES P. MORETON is manager, gas contracts, for Texas Gas Transmission Corp., Houston. With Texas Gas since 1953, Moreton's most recent assignment was supervisor, gas contracts.

DONALD L. DEVRIES is sales manager of the Metal Products Division of Koppers Co. Inc., Baltimore. Before his recent appointment, DeVries was manager of the division's industrial gas cleaning department.

HUGH W. BAIRD has been elected to the board of directors of Midwest Piping Co. Inc., St. Louis. Baird is president and board member of Standard Pipeprotection Inc., St. Louis.

DR. HORACE N. LANDER is assistant director of research for Youngstown (Ohio) Sheet & Tube Co.

HAROLD M. SMALL has joined the Buflovak Equipment Division of Blaw-Knox Co., Buffalo, as sales manager. Prior to joining Buflovak, Small was with Stockdale Engineering Ltd. of England and was vice president of Filtration Engineers Inc.

B. P. NIXON is production superintendent for Lone Star Producing Co.'s Oklahoma district, headquartered in Duncan. Nixon succeeds the late TED SCOTT.

DAVID P. CORKILL has been named area manager for Northern Natural Gas Co.'s new operations office in Minneapolis.

NORMAN V. KINSEY JR., Shreveport, has been elected a director of Transcontinental Gas Pipe Line Corp., Houston. He succeeds his father, the late NORMAN V. KINSEY, who was a member of the original board of directors of the company.

R. G. BRYAN has been named district manager for United Gas operations at Lafayette, La. He will be in charge of the company's increased drilling activities in south Louisiana. He also will be in charge of United's pipeline operations in the area. Succeeding Bryan as New Orleans district manager is J. H. ECHTERHOFF. For the past three years, Echterhoff has been assistant to the executive vice president of the pipeline company.

HARVEY B. COX JR. has joined Cooper-Bessemer Corp. as a sales engineer in the Houston branch office.

MAX P. WATSON has been elected a member of the board of directors of United Gas Pipe Line Co., Shreveport. Watson, a 23-year veteran with the United Gas organization, is presently assistant to the president of United Gas Corp. and its wholly owned subsidiaries.

WALTER P. BARRETT heads Dravo Corp.'s machinery sales department. He headquarters in Pittsburgh.

Several men have been promoted in Trunkline Gas Co.'s engineering department. R. C. NEWSOME is manager of engineering design; A. W. MCANNENY is manager of engineering planning; and H. C. WILLIAMS is administrative assistant to the chief and assistant chief engineer. Under McAnneny's management are L. V. PARENT, supervising engineer, planning, and L. C. SULLIVAN, supervising engineer, research. J. B. SELLERS, as supervising engineer, pipelines, heads pipeline construction activities.

WILLIAM BOBRICK and LOUIS MAIER are recent appointments in the engineering-chemical department of Pittsburgh (Pa.) Chemical Co. Bobrick is construction manager and Maier is instrument engineer.

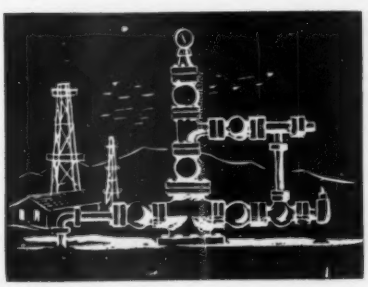
Northern Natural Gas Co.'s gas purchased operations has made the following promotions and transfers: DAVID LAGE JR. promoted to supervisor of clerical service; HAROLD BARRETT, promoted to supervisor of operations; WAYNE BROWN transferred from Hobbs, N. M. and promoted to gas engineer; ORVILLE BRUCE JONES, promoted to well test engineer and transferred to Liberal, Kan.; and JAMES WELSCH transferred to Hobbs from Liberal as well test engineer.

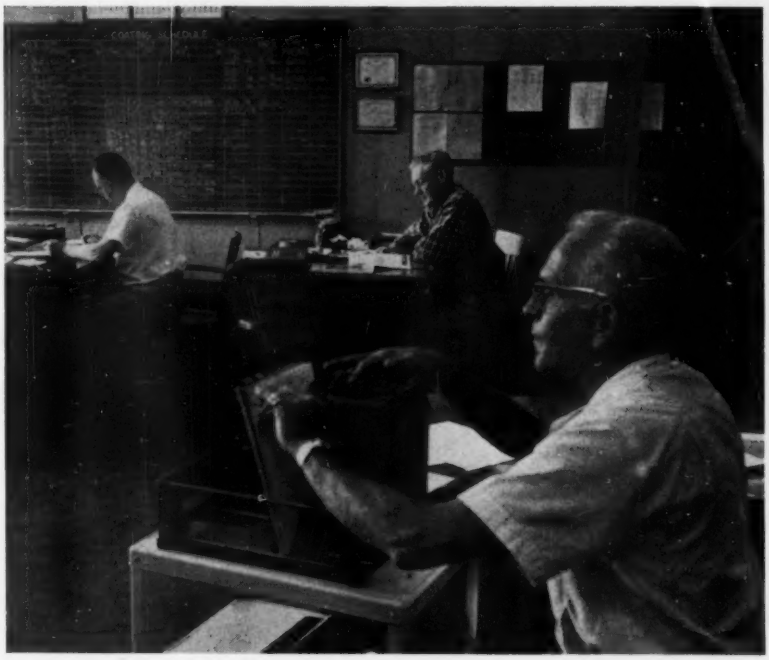
DANIEL E. ZAREMBA has been appointed plant engineer-industrial chemicals at Pittsburgh (Pa.) Chemical Co.

Two men have been promoted in Transcontinental Gas Pipe Line Corp.'s measurement department. E. N. ARMSTRONG, formerly superintendent of measurement, is assigned the new post of director of measurement research. W. W. COFIELD, who has been serving as assistant superintendent, succeeds Armstrong. Transco also announced the appointment of JAY C. MCELROY to superintendent of Station 34 in Grover, N. C.

Walworth Co.'s new Lubricated Plug Valve division in Houston is headed by Vice President CLYDE W. COOK. Assistant vice president of the operation is R. FRED KLEIN, located in the New York headquarters.

Northern Natural Gas Co.'s recently opened area operations office in Des Moines, Iowa, is headed by EVAN M. GRIFFITHS as area manager.





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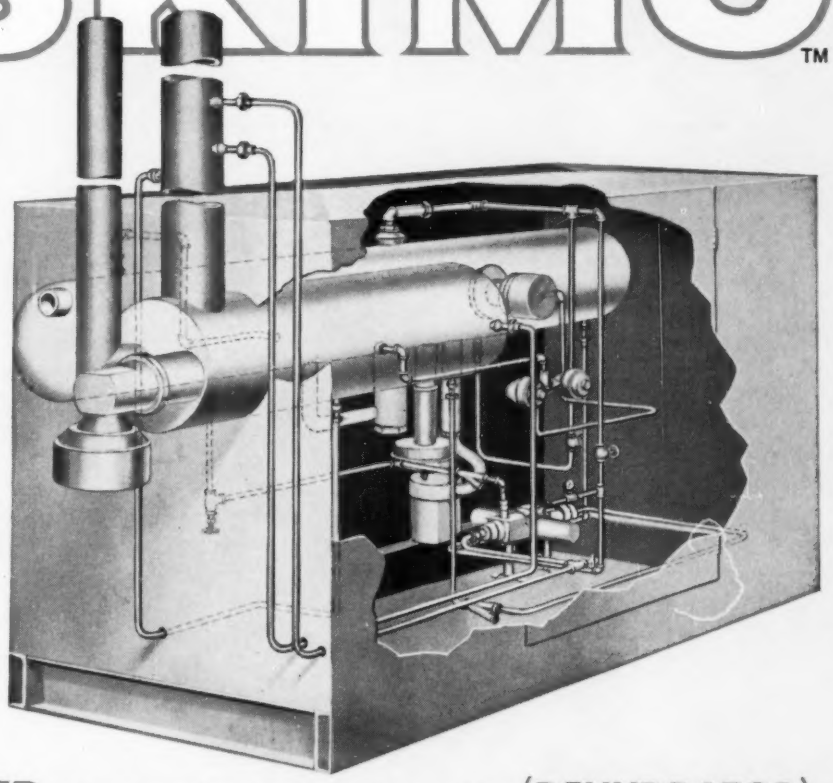

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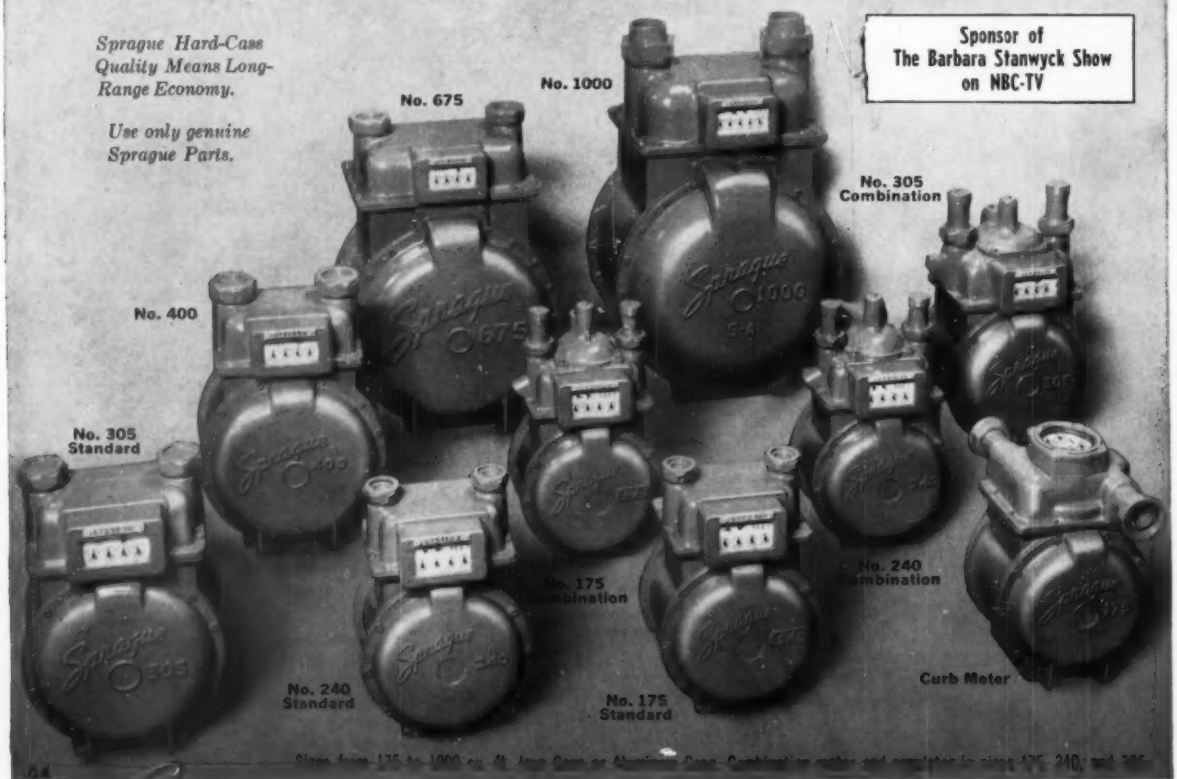

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